the OIL AND GAS JOURNAL

JULY 15, 1957

Miscible-Phase Displacement

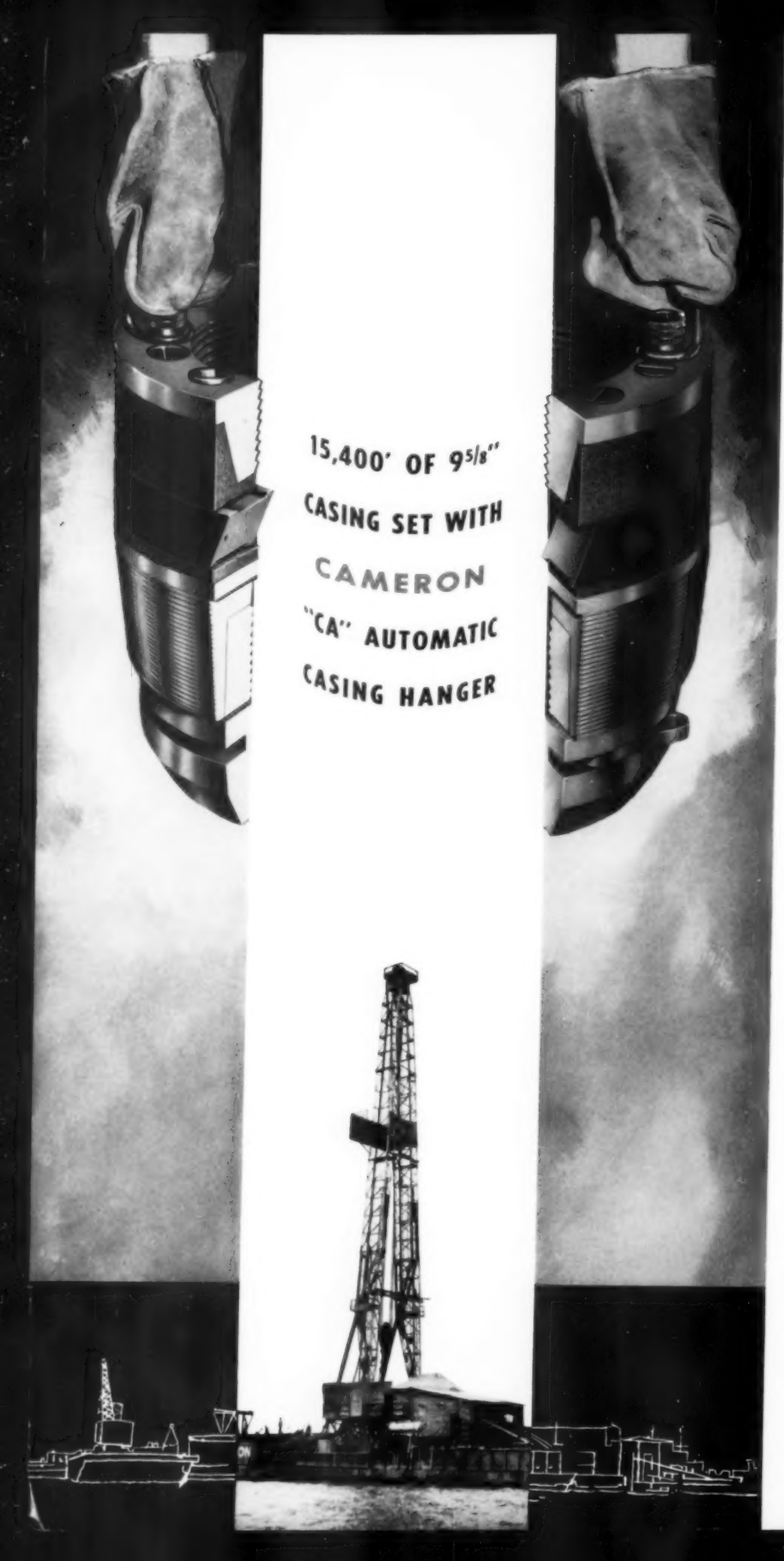
. . . New oil-recovery idea, with a fresh twist added, scheduled for a field trial

p. 59

SAUDI ARABIA'S OIL

Basic pattern of exploration remains unchanged. Secondary recovery may mean more wells in developed fields.

p. 84



BURTON DRILLING BARGE SETS LONGEST STRING OF CASING

At Lake Palourde in Louisiana a record string of 15,400 feet of 9⅝" N-80 46 lb. casing was successfully set with a Cameron "CA" Automatic Casing Hanger. This is only one of many extreme service installations made with the labor saving, foolproof "CA".

In 1950 Cameron started a research and development program to produce an automatic casing hanger for even greater lengths of pipe. Early in 1956 design features were finally consolidated and test records were set in Cameron's experimental lab which exceeded all expectations. Today these records are being repeated in the field. The "CA" will automatically suspend all anticipated casing lengths without "bottlenecking" at pipe loads equivalent to API joint strength—will seal highest pressures even though casing load may be extremely low. For dependable and instantaneous operation, for any load, light or heavy, at any pressure encountered today, choose the Cameron "CA" Automatic Casing Hanger.

Cameron

IRON WORKS, Inc.

P. O. Box 1212 — Houston, Texas

Export Office: 7912 Empire State Bldg., New York City. In England: Cameron Iron Works, Ltd., Time & Life Bldg., New Bond Street, London W. 1, England

JOURNAL News Letter

July 15, 1957
Tulsa, Oklahoma

Talk of a crude-price increase is now out in the open:

I.P.A.A. President Robert L. Wood is publicly calling for at least 5 cents a barrel higher prices to offset recent cost increases.

His argument:

...Steel costs in the oil industry have just gone up $36 million--the equivalent of at least one cent per barrel of oil production.

...Annual wage costs are up $100 million--adding another 3.75 cents to cost of producing a barrel of oil.

...Other costs, such as materials and deeper drilling, are adding to the producers' financial burdens.

Wood's warning: Any delay in passing on these cost increases merely increases the amount needed at a later date to provide adequate funds for exploration and development.

Arguments for the increase are sound. The need is there. Unfortunately the present demand-supply situation makes timing poor. The day will come when oil industry must relate its prices more to costs.

Some refiners are making a valiant effort to recover their rising costs with higher wholesale prices on products.

Veteran management people predict this also will have to become general within a few years. They reason like this:

Only explanation for favorable oil industry profits in face of rising costs in the past is increased efficiency and rising demand.

This can't go on forever.

The crisis will come when demand starts leveling off and prices on new installations get so high that greater efficiency will not offset inflationary capital costs.

Note to producers: Imports controls are still coming this month.

The cabinet committee working on the issue expects to hammer out its plan within a week, and to announce it within 2 weeks. Insiders say the final plan will be a compromise between stiff federal controls and an industry voluntary effort. (p. 61).

This is the plan as presently being drafted: Each importer will be specifically requested to reduce his imports by so much--a percentage of his 1956 cargos. The request will be made public. And so will his reply. Cooperation will be voluntary: It will be backed, however, by pressure of publicity and threat of federal action if the plan fails.

Don't expect the new Canadian Government to interfere with export of gas by Trans-Canada into the United States--if it is approved by the FPC.

Political reports circulating in Ottawa say the new government will investigate the "cheap" price which Tennessee Gas will pay for Alberta gas at Emerson, Man. But Trans-Canada officials don't appear disturbed.

When parliament convenes in October, the Progressive Conservatives can be expected to make some noise. They'll attack the way the Liberals rammed through the Trans-Canada loan and about stock options to Trans-Canada officials.

But this is important: Prime Minister Diefenbaker is giving no public indication that he will not honor the export permit promised by his predecessor.

Texas Eastern's swap of stock for La Gloria merely emphasizes a trend among natural-gas transmission firms.

Managements of these regulated companies frankly are hunting investments where profits are unrestricted. With interest rates rising, their 6 per cent profits for transporting gas aren't proving too attractive.

Several other big transmission firms already have made the move into refining, petrochemicals, marketing--even as far afield as real estate and insurance.

That crude line from Midland to Houston is taking another tack.

Mustang Pipe Line Co. has been organized by Phillips Petroleum and other West Texas producers to build the 26-in. crude carrier.

The project is a substitute for the Industry Pipe Line which Magnolia pushed earlier. Magnolia decided instead to expand its existing system rather than wait for a big joint-ownership line to be built.

Studies for a new 8-in. L.P.G. line from West Texas to Chicago point up the trend toward increased pipeline movement of this product.

An alternative to this project is a line from West Texas to Houston. L.P.G. could be transhipped there to the Upper Midwest by Texas Eastern's Little Inch. This line will handle L.P.G. as well as other products when it is converted from natural gas in September.

One fact is emerging from wildcatting statistics in the first half: The success ratio is holding steady despite a drop in number of wells.

You can expect the national average to stick pretty close to last year's 16.6 per cent when complete figures are in later this month. It all adds up to a more careful selection of locations by the wildcatters.

Indicated success averages: Offshore Louisiana 42.9 per cent; San Juan

basin 40.4; Southern Louisiana 31.2; Texas Panhandle 30.4, a new high for that area; Permian basin 24.2; Utah 20.4; Oklahoma 19.5; West Texas 18; Arkansas 18.9; Kansas 17.3; California 13.7; Wyoming 12.1; Kentucky 14.5; Mississippi 11.6; Michigan 10.8; North Dakota 10.9; Montana 9.4; Colorado 8.2.

The big oil finds so far this year have been in Aneth field and offshore Louisiana. Elsewhere emphasis has been mostly on depth with little significant addition to reserves. Figures reveal this more clearly: New oil in the first half totaled 1.34 billion barrels. Production was 1.35 billion barrels.

Despite pessimism in many circles, oil finders still are confident exploration will rebound in the second half.

Signs of the drilling pickup already are being seen.

Rotary rigs working in the Rockies at the first of the month reached 270, highest of the year. About 35 per cent of the new locations were wildcats.

Utah now has 49 rigs working, a new record for the state.

Drilling emphasis in Colorado is shifting to the western section from the Denver basin. The state had 14 new locations last week, 10 of them wildcats.

Work still remains good in Western Nebraska and the San Juan basin.

Activity gradually is picking up in Venezuela.

Kerr-McGee is sending its second drilling tender south for assignment in Lake Maracaibo. By September, it will begin drilling in Block 17, a 24,700-acre concession owned by a group of American firms, headed by Phillips.

Production in Venezuela hit an all-time high of 2,974,000 bbl. daily late in June. An interesting aspect of the increase is provided by Venezuelan Atlantic, which has pushed its production to a new record of 28,332 bbl. daily. Atlantic Refining officials reportedly hope to make their company self-sufficient in oil through its Venezuelan subsidiary.

Guatemala will get its first real wildcat this month.

Sloane Exploration Co., Houston, has shipped a slim-hole rig, specially designed for operations in Guatemala's rough terrain. It will drill on the Morales concession about 35 miles southwest of Puerto Barrios. Only drilling in the nation so far has been core drilling, although officials have granted 38 concessions to date.

Shell is putting its much discussed portable diesel-electric drilling rig to work in the Four Corners area where company plans 100 wells this year.

The $375,000 unit, first of its kind in the industry, since delivery last December has completed 16 wells in Colorado and Nebraska. Officials report it has saved valuable time in moving, setting up, drilling, and dismantling. Operations have been almost trouble-free mechanically.

Company wants to test the equipment in various areas, during all kinds of weather, before making a definite evaluation of its possibilities.

PRODUCTION men will be intrigued by the new twist Atlantic Refining

has given to a miscible phase displacement plan.

Atlantic in a West Texas project proposes to:

...Inject a propane slug.

...Follow with a gas band.

...Inject gas and water in alternate slugs.

The idea is to extend the reach of the propane slug and recover essentially all the crude in the reservoir. It is expected to overcome some of the drawbacks of miscible-phase displacement when propane is used alone.

Look for a marginal gas-well law to be pushed in Texas before long.

Oil-proration regulations permit an oil well to be assigned a marginal allowance so it may be depleted. Production from the strippers is subtracted from total demand to arrive at an allowable figure for healthy wells.

No such provisions exist under gas proration rules. Wells with limited capability insufficient to meet allowables upset proration picture. If these could be designated as strippers, it would be easier to allocate demand properly among remaining gas wells.

American Petrofina, Inc., a unit of the giant Belgian oil outfit, is wasting no time upgrading its newly acquired Texas refinery.

Plans call for addition of catalytic reforming and alkylation capacity to the 28,500-bbl. daily Mount Pleasant plant. Program will cost roughly $3 million, including $1-1/2 million HF alkylation unit, a $1-1/4 million catalytic reformer and $250,000 in new tankage.

The plant, recently purchased from American Liberty Oil, incorporates Thermofor catalytic cracking and polymerization facilities.

Are anchor chains or strand steel cables better to secure drilling tenders?

This has been a running argument among offshore oil-equipment men. Hurricane Audrey added to the little tempest.

Kerr-McGee's W.C. Savage reports that tenders which broke loose in the storm used cables. All Kermac tenders secured by anchor chains rode out the storm safely.

Savage's explanation: Chains provide catenary action. This plus their weight provides a cushion against sharp shocks which cause lines to part.

Hurricane Audrey is nearly history now, but one of the little publicized stories about the storm is the heroic mercy role played by the oil industry.

How the industry rose to the emergency in the disaster is a bright page for oil men, often maligned as heartless money grabbers.

Company after company sent boats, helicopters, equipment, manpower, and supplies of medicine, food, drinking water and gasoline into the Cameron area. The marsh buggies of the oil industry became the disaster work horses.

Officials at the scene agree on one thing: Without the heavy equipment and resources thrown quickly into the effort by oil men, loss of life and property might have been much higher.

Walworth iron body saddle type wedge gate valves are suitable for use on steam, water, gas, gasoline, oil, and many process lines. They are easy to take apart, simple to service, fast to reassemble. Walworth saddle-type valves are available in a wide range of sizes in eleven different combinations of design and materials including bronze-mounted, all-iron, and ni-resist; with both flanged and screwed ends. All types can be repacked under pressure when fully opened or fully closed.

Ask your local Walworth distributor to give you complete information or, write for circular.

WALWORTH

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

WALWORTH SUBSIDIARIES: ALLOY STEEL PRODUCTS CO. • CONOFLOW CORPORATION • GROVE VALVE AND REGULATOR CO. SOUTHWEST FABRICATING & WELDING CO., INC. • M&H VALVE & FITTINGS CO. • WALWORTH COMPANY OF CANADA, LTD.

the OIL AND GAS JOURNAL

JULY 15, 1957 • NUMBER 55 • NUMBER 28

TULSA OFFICE
211 South Cheyenne Ave.
Phone Diamond 3-6291

THE STAFF

Kenneth B. Barnes ..... Editor
Henry D. Ralph ..... Chief Editorial Writer
Ted A. Armstrong ..... News Editor
Gerald L. Farrar ..... Engineering Editor
Dr. Frank J. Gardner ..... Exploration Editor
Paul Reed ..... Pipeline Editor
John C. Reidel ..... Petrochemical Editor
C. O. Willson ..... Consulting Editor
W. L. Nelson ..... Technical Editor
Lynn M. Nichols ..... Presentation Editor
John C. Casper ..... Economics Editor
Neil Williams ..... Associate Editor
Norman S. Morrisey ..... Drilling-Development Editor
Carl J. Lawrence ..... Assistant News Editor
Gene T. Kinney ..... Assistant Pipeline Editor
R. B. Tuttle ..... Equipment Editor
Bill Linville ..... Assistant to Presentation Editor
Carl Hoot ..... District Editor
John C. McCaslin ..... District Editor
W. A. Bachman ..... District Editor
J. O. Scott ..... District Editor
J. C. Bradford ..... District Editor
Robert B. Bizal ..... District Editor
Sara Bangert ..... District Editor
LaWanda Turner ..... Readership Research
Helen Brown ..... Editorial Assistant
Alice Burt ..... Editorial Assistant
Aileen Cantrell ..... Editorial Assistant
C. Dudley Johnston ..... Art Director
Jo Jeanne Speaker ..... Staff Artist

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-6160

George H. Weber ..... Refining Editor
Paul Swain ..... International Editor
Ray G. Gibson ..... District Editor
John P. O'Donnell ..... District Editor

HOUSTON OFFICE
802 Sterling Building
Phone CApitol 4-7726

Larry Reser ..... District Editor
Ed McGhee ..... District Editor
Joe Reilly ..... District Editor

DALLAS OFFICE
1238 Mercantile Building
Phone Riverside 8-3074

Robert J. Enright ..... District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone VAndike 0722

D. H. Stormont ..... District Editor
William T. Smith ..... District Editor

WASHINGTON OFFICE
621 Albee Building
Phone District 7-1710

Bertram F. Linz ..... District Editor

Correspondents at Denver, Pittsburgh, Calgary, Columbus, Ashland, Ky., Oil City, Pa., Mount Pleasant, Mich., Melbourne, Australia; Regina, Sask.; Chatham, Ont.; Casper, Wyo., and Anchorage, Alaska.

The Oil and Gas Journal, Published Mondays, copyright 1957, by The Petroleum Publishing Co. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. United States and foreign rates to the petroleum industry, 1 year $4, 2 years $7, 3 years $8.

IN THE NEWS

Processing:

Two Toronto Refineries Win Final Approval 63
O.C.A.W. Worried About Growth of White-Collar Jobs 64
Finances Snag Seminole's Proposed Florida Refinery 68
Mobile Scaffold Speeds Maintenance at Esso Refinery 68
How Esso Cut Air Pollution at Bayway Plant 69
Sohio Sues O.C.A.W., Charges Taft-Hartley Violation 69
Processing Briefs 72

General Interest:

Gas Bill Clears House Committee Without Changes 60
Imports-Control Plan Still Expected This Month 61
Texas Eastern Expands in Production, Refining 62
City Tiffs With California Over Offshore Evaluation 67
Hugh Roy Cullen, a Legend in Oil, Dies 70
Huge Spending Program Easing Smog in Los Angeles 72
Iran Nips Communist Plot to Blow up Abadan Refinery 77

Production:

Gas, Water Slugs Added to Miscible-Phase Displacement 59
California Operators Act to Curb Water Pollution 67

Exploration:

Amerada May Have New Pay for Williston Basin 71
San Juan Gets New Gallup Oil Trend 74
Deep Gas Field Opened in South Mississippi 74
What Iran's Proposed Oil Bill Would Mean 77
Houston Company Plans Guatemala's First Wildcat 78
U. S. Mining Firm May Enter Algerian Oil Search 80
An-Son Makes Drilling Deal With Socony in Colombia 81
Kermac Set to Drill in Lake Maracaibo for Phillips Combine 83
Reserves Lag Despite March of Discoveries 165
Ventura Basin Gets New Deep Activity 166
Will Northeast Alden Rival Apache? 170

Pipelining:

FPC to Study Pipelines' Price Increases to Affiliates 70
Pipeline Briefs 71
Southern Pacific Completes Part of New Line 74
First Crude Flows Through Venezuela's Aguasay Line 81

OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

. . . an integrated magazine serving an integrated industry

TECHNOLOGY—OPERATION

Refining-Processing

Using the Absorption Factor to Keep Lean-Oil Rate Down 88

By W. T. Lanz

A method and correlations are presented here for determining optimum product recovery at minimum absorption oil circulation. You can estimate quickly an oil rate for a new design or check on the performance of an existing absorber.

Urea Adduction For Making Light, Low-Pour Lubes from Waxy Crudes 107

By T. H. Rogers, J. S. Brown, Robert Diekman, and G. D. Kerns

Standard Oil Co. of Indiana authors tell about the two-step process involving solvent dewaxing followed by urea dewaxing, in which the best features of both are combined. Urea dewaxing may also be useful for one-step dewaxing of stocks that contain little wax.

Questions on Technology 116

The Foreman's Page 118

Field Processing 120

PETROdatics 122

Pipelining

Getting a Pipeline Across A River 96

By L. M. Odom

Part 2 of three parts. This deals with the factors involved in design of a pipeline river crossing: effects of buoyance, stream currents and turbulence, sand movement, corrosion, etc.

Pipeline Patrol: Gulf's Sicily Crude Line 131

This line was built under almost every imaginable handicap. The right-of-way was only 19 ft. wide. Some 2,300 property owners along the 36½-mile route had to be contacted. Sixty-three per cent of the ditch had to be blasted out of solid rock. It took 300 days to build.

Drilling-Production

Small Holes Pay Off for Humble 92

By G. E. Cannon and R. A. Watson

Cost of wells has been reduced 14 per cent in Humble's program of smaller holes. Savings are due to use of smaller rigs and materials.

How To Treat Sour Brine for Flooding 102

This deals with four water-flooding projects in Bartlesville-Dewey field and one in Hogshooter field, Washington County, Oklahoma.

How to Calculate Complex-System Gas Flow 112

By Dr. J. M. Campbell

Number 37 in a continuing series covering the Elements of Field Processing.

Exploration

Exploration in Saudi Arabia 84

By W. H. Thralls and R. C. Hasson

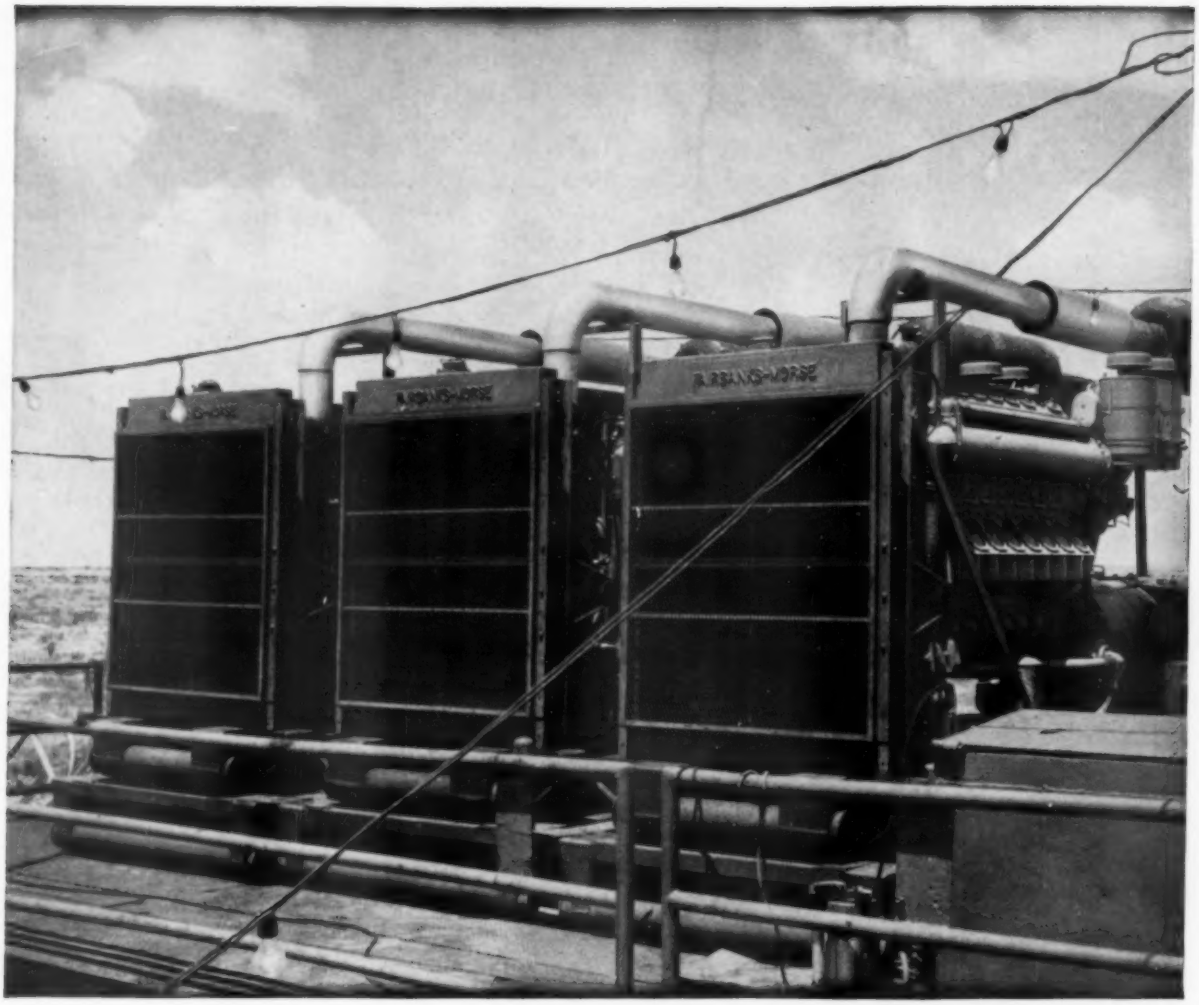
This is Part 1 of two parts by Arabian American Oil Co. authors on the geology, physiography, exploration history, and data on Saudi Arabia's oil production. Part 2 will appear next week.

General

Special Management Foldout: Making Decisions 125

DEPARTMENTS

They Say	45	Field Processing	120	Personals	181
Calendar of Events	50	PETROdatics	122	Statistical Summary	185
Journally Speaking	55	Pipeline Patrol	131	Drilling Statistics	186
Editorial	57	Books	110, 134	Supply Statistics	187
Watching Washington	65	Drilling Contractors	137	Refining Statistics	188
International News	77	New Equipment	141	Markets	189
Questions on Technology	116	Equipment Men in News	156	Classified Advertising	190
Foreman's Page	118	Exploration Highlights	165	Advertisers' Index	195



The **38-F-90** is a drilling engine

Here's Why

Fuel? . . . The 38-F-90 burns gas, propane or liquid fuel with the inherent economies of diesel compression.

Hp. rating? . . . Continuous slush pump rating is 75 hp. per cylinder, and the six sizes (4-5-6-7-8-10) include the right engine for any job between 300 and 750 hp. Whether four cylinders or ten, it's the same engine, the same width and height, the same operating technique. Many parts are interchangeable.

Speed range? . . . The 38-F-90 is rated for continuous heavy-duty service from 450 to 1200 RPM. This range is right for any mechanical, hydraulic or electric drive.

Give and take? . . . The 38-F-90 is a Fairbanks-Morse engine. This means that it will give service and take punishment. Its simplicity and its stamina are the result of its Opposed-Piston two-cycle design and its all-steel welded frame.

This all adds up to why the Fairbanks-Morse 38-F-90 is a *drilling* engine. Fairbanks, Morse & Co., Oil Field Division, Chicago 5, Illinois.

FAIRBANKS-MORSE

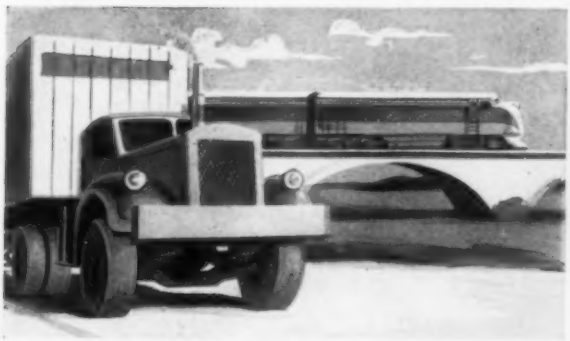
a name worth remembering when you want the BEST

OIL FIELD EQUIPMENT • PUMPS • SCALES • ELECTRIC MOTORS • GENERATORS • LIGHT PLANTS • DIESEL, DUAL FUEL, GAS AND GASOLINE ENGINES MAGNETOS • DIESEL LOCOMOTIVES

Improved fuel oil performance means . . .
BIGGER PROFITS IN EVERY MARKET

AUTOMOTIVE • RAILROAD • MARINE • INDUSTRIAL AND HOME HEATING

Diesel, residual, or heating **. . . whatever the grade of oil, problems peculiar to each can be solved with Du Pont Fuel Oil Additive No. 2 (FOA-2).**



DIESEL • The excellent dispersant action of FOA-2 improves a diesel fuel's filterability—thus minimizing sludge-caused injector-sticking and filter-plugging. Du Pont FOA-2 is a stabilizer as well as a dispersant. By stabilizing cracked distillates, it helps to overcome incompatibility between blends of cracked and straight-run stocks. Another point—being nonmetallic and ashless, FOA-2 does not contribute to sparking from diesel locomotive stacks.

IN HOME HEATING • As a stabilizer and dispersant, FOA-2 prevents sludge formations that cause filter-fouling and nozzle-plugging. It also minimizes ignition failures—its nonmetallic *ashless* feature means no deposits to foul the operation of the electrical system. Thus, it helps eliminate many service calls that cost you money. FOA-2 retards the formation of insoluble residues during storage, too . . . so the oil remains free-flowing and clean-burning.

RESIDUAL • Even small amounts of FOA-2 can prevent sludge formation in tanks and on burner parts. Its outstanding *dispersancy* action removes sludge that has already accumulated. As a result, Du Pont FOA-2 helps to create many more customers and more *satisfied* customers—for residual fuels.

●

With this one additive you acquire definite, demonstrable sales advantages. For more information about Du Pont FOA-2, contact your nearest Du Pont Petroleum Chemicals office.

SALES OFFICES

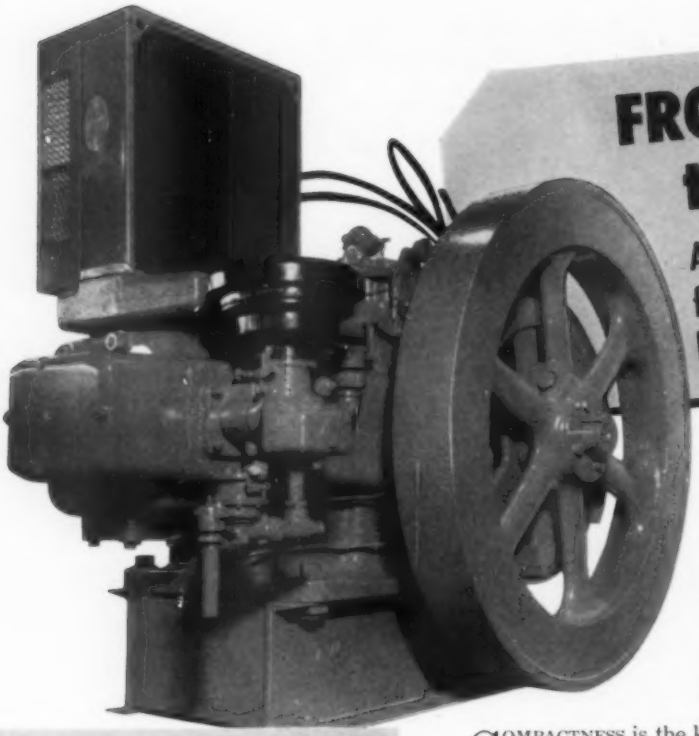
Chicago 3—8 So. Michigan Ave. . . . RAndolph 6-8630 • **Cleveland 15**—25 Prospect Ave. . . . SUperior 1-1363 • **Denver 2**—510 Mile High Center Bldg. . . . AComa 2-2347 • **Houston 2**—705 Bank of Commerce Bldg. . . . CApitol 5-1151 • **Los Angeles 17**—612 So. Flower St. . . . MAdison 5-1691 • **New York 20**—1270 Ave. of the Americas . . . COlumbus 5-2342 • **Philadelphia 2**—3 Penn Center Plaza . . . LOcust 8-3531 • **Pittsburgh 22**—1 Gateway Center . . . ATlantic 1-2933 • **San Francisco 4**—111 Sutter St. . . . EXbrook 2-6230 • **Seattle 3**—4003 Aurora Ave. . . . MElrose 6977 • **Tulsa 1**—1811 So. Baltimore Ave. . . . LUther 5-5578 • **In Canada**—Du Pont Company of Canada (1956) Limited, Petroleum Chemicals, 85 Eglinton Ave. East, **Toronto 12**—Ontario . . . HUdson 1-6461 • **In Other Countries**—Petroleum Chemicals Division, Export Sales, 7447 Nemours Bldg., Wilmington 98, Delaware . . . OLympia 4-5121, Extension 2962.

DU PONT
REG. U.S. PAT. OFF.

Better Things for Better Living
. . . through Chemistry

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & CO. (INC.)—Petroleum Chemicals Division, Wilmington 98, Delaware



FROM WITTE... the NEW F-25

A 25 hp Gas-Gasoline Engine for Medium to Deep-Well Pumping.

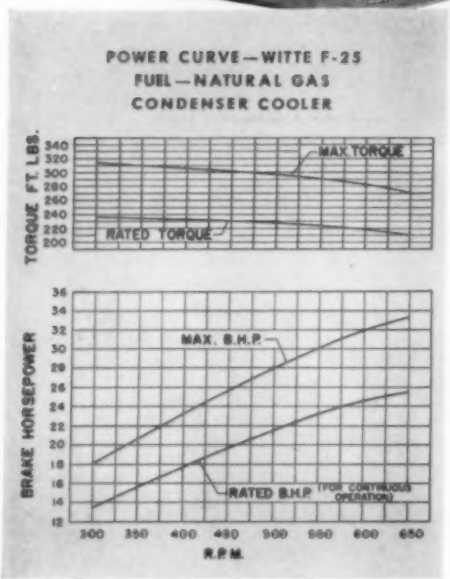
CONDENSER COOLING

SINGLE, HEAVY-DUTY FLYWHEEL

REPLACEABLE WET-SLEEVE CYLINDER LINER

WEATHER-TIGHT CONSTRUCTION

BORE 8" · STROKE 8"



COMPACTNESS is the keynote of the Witte F-25. Simplicity of design, ease of maintenance and operation, and Witte Quality also make this new addition to the Witte line another outstanding engine for oil-field pumping service. The F-25 is built for "'round-the-clock" operation and has a recommended continuous horsepower range of from 15.7 to 25 hp at speeds of from 350 to 625 rpm.

Time-proven features of the other popular Witte Engines are incorporated into the new F-25. It is equipped with a counterbalanced crankshaft, mechanically operated and timed inlet and exhaust valves, pressure-lubrication system with built-in filter, aluminum-alloy connecting-rod bearings, and conventional enclosed clutch power take-off. It is inherently well balanced and designed so that optional accessories become component parts of the engine when installed.

BRIEF SPECIFICATIONS

Bore and Stroke	inches	8" x 8"
Continuous Horsepower Range	hp	15.7 to 25
Continuous Speed Range	rpm	350 to 625
Flywheel Effect at Rated Speed WR^2		1732 lb ft^2
Oil Capacity	quarts	16
Water Capacity	gallons	7
Length, Overall	inches	62¼
Height, Overall	inches	50⅝
Width, Overall	inches	52-11/16
Weight	pounds	3,200

Complete specification and application data available at your nearby Supply Store

WITTE ENGINE WORKS

OIL WELL SUPPLY DIVISION · UNITED STATES STEEL CORPORATION

1608 Oakland Ave., Kansas City 26, Mo.

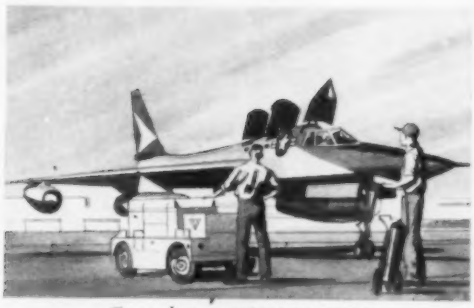
Gas-Gasoline — Oil Field Models from 3¾ to 25 hp.

Full diesel — Oil Field Models from 3¾ to 12½ hp.

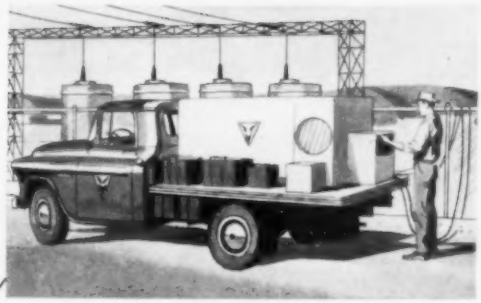
USS

WITTE ENGINES

UNITED STATES STEEL



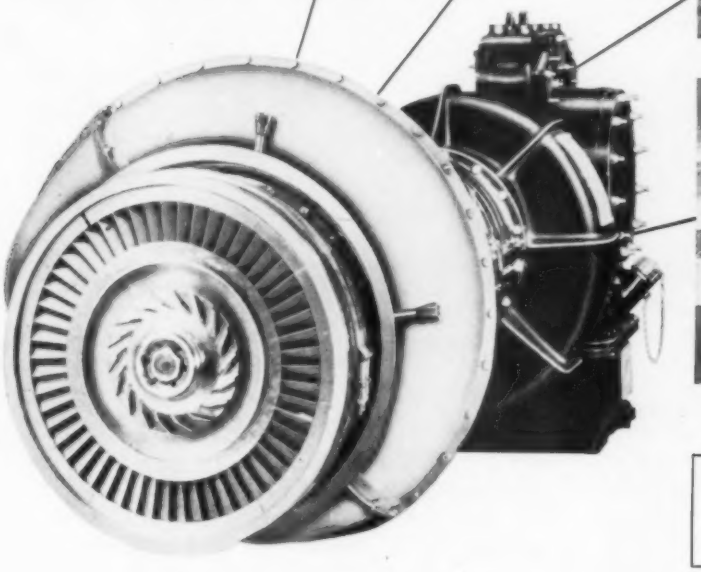
Ground support for jet aircraft.

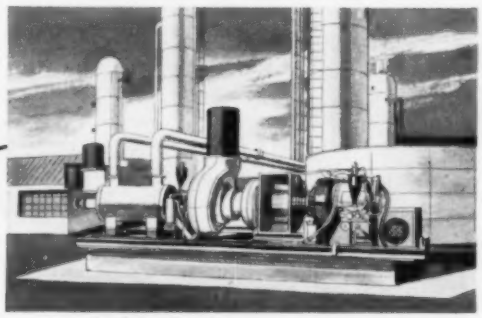


Portable power generation.

Jupiter® finds new uses!

Power for small boat propulsion.





Turbine drives for gas compressors.

ENGINEERS WANTED Unlimited opportunities, challenging projects, good living with Solar! Write for new brochure.

New gas turbine engine proves its versatility

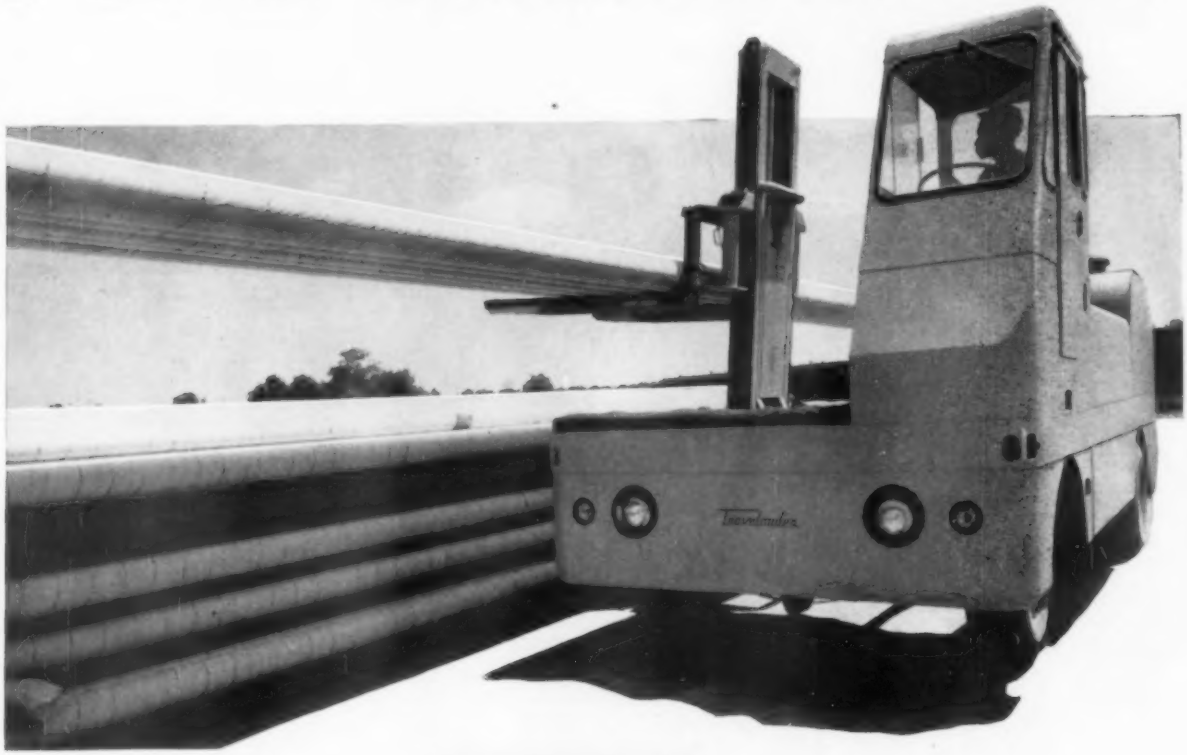
JUPITER GAS TURBINES provide reliable power for a wide range of military and industrial uses. Simple and rugged, compact and lightweight, the 500 hp Jupiter offers many advantages over conventional power plants. New users praise its high power-to-weight ratio, its instant starting even under severe temperature extremes, its easy portability and low maintenance requirements. Experience has proven the effectiveness of Jupiter gas turbines for power generation, boat propulsion, mechanical drive and still other applications. Perhaps this versatile engine can help solve your special power problems. Write for new Solar gas turbine brochure... Dept. D-54, Solar Aircraft Company, San Diego 12, California.

SOLAR
AIRCRAFT COMPANY

SAN DIEGO
DES MOINES

DESIGNERS, DEVELOPERS AND MANUFACTURERS – GAS TURBINES • AIRCRAFT AND MISSILE COMPONENTS • BELLOWS • CONTROLS • COATINGS • METAL ALLOY PRODUCTS

FAST···SAFE PIPE HANDLING!



with ®Traveloader

If you handle pipe—or any other long, unwieldy loads—you now have another weapon to fight increasing overhead costs. Traveloader, the unique side-loading fork truck built by Baker, makes substantial savings in four ways: ***time, manpower, equipment and space.***

Traveloader easily picks up loads of almost any length from the side, carries them securely on the truck deck and unloads or stacks them to a height of 12 feet. It can operate in 10-ft. aisles, on paved or unimproved roadways, and can travel safely with load at speeds up to 35 mph. Thus Traveloader, with one operator, does the work of two or three other pieces of handling equipment, does it faster and safer, and requires less space to maneuver.

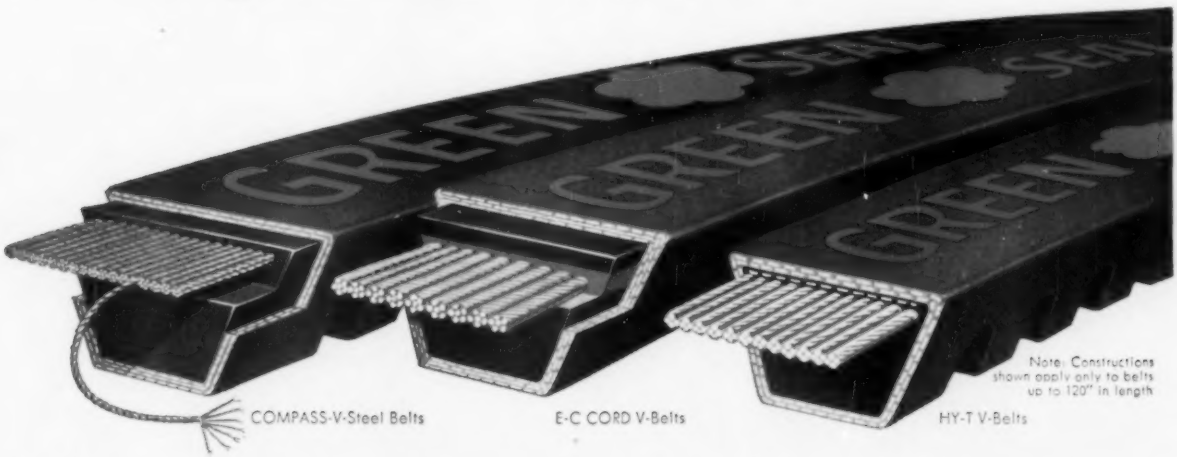
Capacities to 30,000 lbs., gas or diesel operated.
For more information write for Bulletin 1360.

Baker®
industrial trucks

THE BAKER-RAULANG COMPANY
1247 WEST 80th STREET • CLEVELAND 2, OHIO
A Subsidiary of Otis Elevator Company

Otis

Now—V-Belts with the Green Seal solve the major multiple drive problem



The Green Seal stands for true dimensional stability in V-belts. And with Green Seal dimensionally stable belts you can be sure that matched sets are truly matched and will stay matched—that mismatching (the biggest problem in belting multiple drives successfully) is a thing of the past.

The key to dimensional stability lies in the tension members of the belt. For many years, steel cables as developed by Goodyear were the only length stable load carriers, but now they have been joined by synthetic cords, thanks to the amazing Triple-Tempered 3-T process.

The 3-T process is an exclusive method of tempering the cord with Tension, Temperature and Time for maximum strength and minimum change in dimensions. This assures no change in length during storage plus greatly increased shock- and stretch-resistance on the drive.

The end result is smoother, longer-running teams of belts that give you maximum, trouble-free, horsepower hours at minimum cost. What better reason for specifying V-belts with the Green Seal?

DIMENSIONALLY STABLE V-BELTS with the GREEN SEAL by

GOODYEAR

THE GREATEST NAME IN RUBBER

The Goodyear Tire & Rubber Company, Industrial Products Division, Dept. 794, Akron 16, Ohio

Please send me more information about how V-Belts with the Green Seal solve the major problem in belting multiple V-belt drives.

Name_____

Company_____

Street Address_____

City_____ Zone_____ State_____

Compass, E-C Cord, Hy-T, Green Seal—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

Weeds are a hazard you can't afford

Destroy them with Baron, Radapon and other Dow weed killers

Another car filled with highly flammable material is due in any minute. There's a small leak in the pipeline in the foreground. All that's needed is a discarded match to transform this loading dock into an inferno.

Fire is the biggest hazard caused by weeds, but it's not the only one. Uncontrolled vegetation also hides poisonous plants and things to trip over. It causes inconvenience to workmen, obscures vision around security fences and gives the whole plant an untidy, sloppy appearance.

Get weeds out of your picture once and for all with Baron®, Radapon® and other Dow chemical weed killers. They're economical, safe and easy to use. If your problem is a large one, professional contractors can help you save money. Let us send you more information and the name of a qualified distributor near you.

Write for free new booklets on industrial vegetation control. THE DOW CHEMICAL COMPANY, Midland, Michigan, Department AG314.

YOU CAN DEPEND ON DOW

AERO COMMANDER OUTSOLD ITS CLOSEST COMPETITOR BY MORE THAN

58%

IN THE FIRST FIVE MONTHS OF 1957*

Executive transports are bought for one reason only—because they deliver the superior performance demanded by business and industry.

The 7-place Aero Commander outsold its closest competitor by more than 58% in the first five months of 1957 because the COMMANDER DELIVERS TRULY SUPERIOR PERFORMANCE IN EVERY RESPECT. Don't be misled by extravagant advertising claims. Aero Commander is PROVED SUPERIOR IN ACTUAL USE. Check the weight and balance data from any Aero Commander owner's log book against any other twin-engine executive transport in its class. These incontestable figures prove absolutely that Aero Commander provides MORE PAYLOAD . . . GREATER RANGE . . . and HIGHER SPEED.

Your Commander distributor will be pleased to refer you to a Commander owner in your area.

* SOURCE: FIGURES RELEASED BY AIRCRAFT INDUSTRIES ASSOCIATION.

AERO Commander

560-E - 680-S

AERO DESIGN & ENGINEERING CO
TULAKES AIRPORT • P O BOX 118 • BETHANY, OKLAHOMA

A Clear Look....

at the economics of Petroleum Products Marketing

For nearly a half century UOP has been developing and engineering processes for more efficient and more economic production of petroleum products and by-products. Always of primary concern, too, has been the profitable manufacture and marketing of these products by the individual refiner.

Because of this extensive experience Universal is now able to offer the industry the services of a highly qualified marketing and economic research group to help refiners, established or potential, plan intelligently for future development.

This service is comprehensive. It includes such factors as designation of profitable markets, sales potentials, organization and installation requirements, plant locations, product and by-product determination, facilities and raw material supply, manpower and transportation availabilities, financial requirements, projected yields . . . a full and careful analysis of *all* the factors involved in manufacturing and marketing petroleum products. The service is available to any refiner, anywhere, regardless of the volume or scope of his operation.

UNIVERSAL OIL PRODUCTS COMPANY

30 ALGONQUIN ROAD, DES PLAINES, ILLINOIS, U. S. A.

More Than Forty Years Of Leadership In Petroleum Refining Technology

DEPENDABLE RUGGED PUMPING

3,000 TO 32,000 POUNDS MAXIMUM POLISHED ROD LOAD

with CABOT

ADJUSTABLE CRANK BALANCED

Cabot adjustable crank pumping units are available in sizes from 7,000 to 32,000 pounds maximum polished rod load. Adjustments are simple. One man can make them from the ground. No heavy lifting. No complicated tools needed. All that's required is to loosen two bolts, move weights to desired position and tighten bolts. Single-piece inner weights easily added.

BEAM BALANCED

Cabot beam balanced pumping units are available in sizes from 3,000 to 11,000 pounds maximum polished rod load. Full beam counterweighting furnished. Weights can be easily installed any place along the beam without moving other weights. Safety rails provided. 15% crank counter weighting optional. Easily installed with two bolts.

MINIMUM OF DOWN TIME

Rugged dependability and "on the spot field service" provide a pumping unit assuring you of less down time. Cabot's 24-hour parts and maintenance shops at Odessa, Houston, Alice, Kilgore, Pampa, Compton, Great Bend, Lindsay, Seminole, Tulsa, Casper, Farmington, and Edmonton.

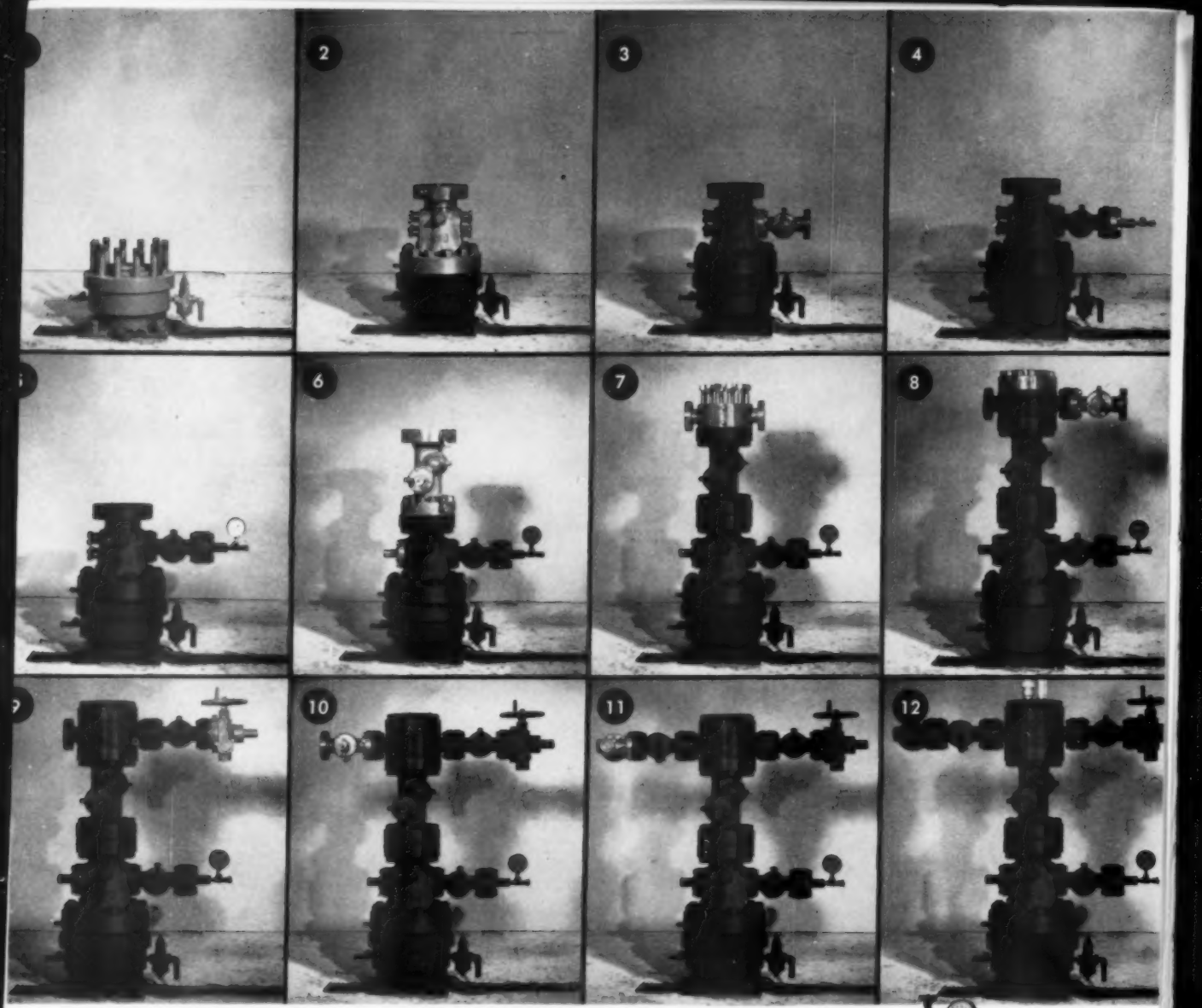
OIL FIELD PUMPING EQUIPMENT

CABOT SHOPS, INC.

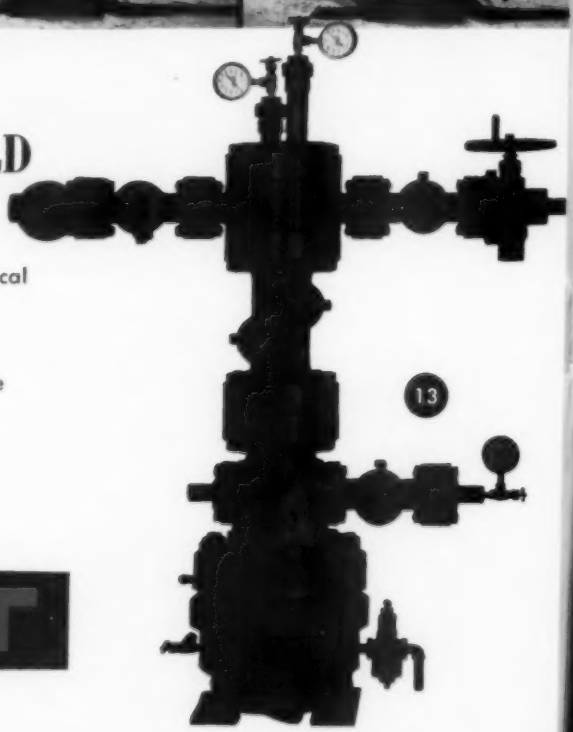
PAMPA, TEXAS

FRANKS DIVISION OF CABOT

There's a quality Cabot pumping unit to meet your needs. Call your J&L Supply Man.



"STEP-BY-STEP STORY" of the BEST DUAL ASSEMBLY IN THE FIELD



From the first bolt to the last gauge, the dual tree shown above in the various stages of growth, represents the most practical and efficient dual well control equipment in the field. It is an O-C-T Dual Tree, including the new and revolutionary O-C-T Universal Tubing Head.

Dual assemblies, pioneered by O-C-T and now improved to give you even greater versatility, answer long existing problems. For deep or shallow multiple pay zones... if you make **any** kind of dual completion... make it O-C-T, the pioneer and leader in dual completion equipment.

OIL CENTER TOOL CO.

Houston, Texas

O·C·T

PARKERSBURG
METAL BUILDINGS

Fast, Permanent Protection For Key Facilities

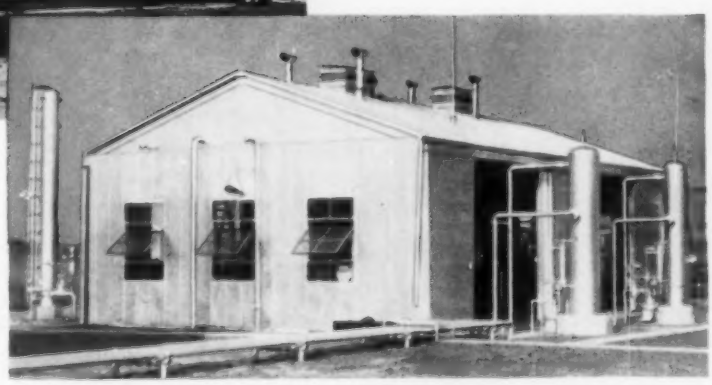
Parkersburg pre-engineered metal buildings offer the quick, modern way to house your vital installations. As the finest quality line available today, these attractive units provide the strength, rigidity, and and weather resistance that add up to your greatest dollar-for-dollar value.

These buildings are portable, and can be painted, insulated and easily enlarged. Check into this top quality line today by writing to Department N-1.

60 Years of Successful Service!

BUILDING DIVISION SALES OFFICES: Dallas, Atlanta, New York, Chicago, Parkersburg

Authorized Sales Representatives and Dealer Erectors in Major Cities



BUILDING
PARKERSBURG
DIVISION

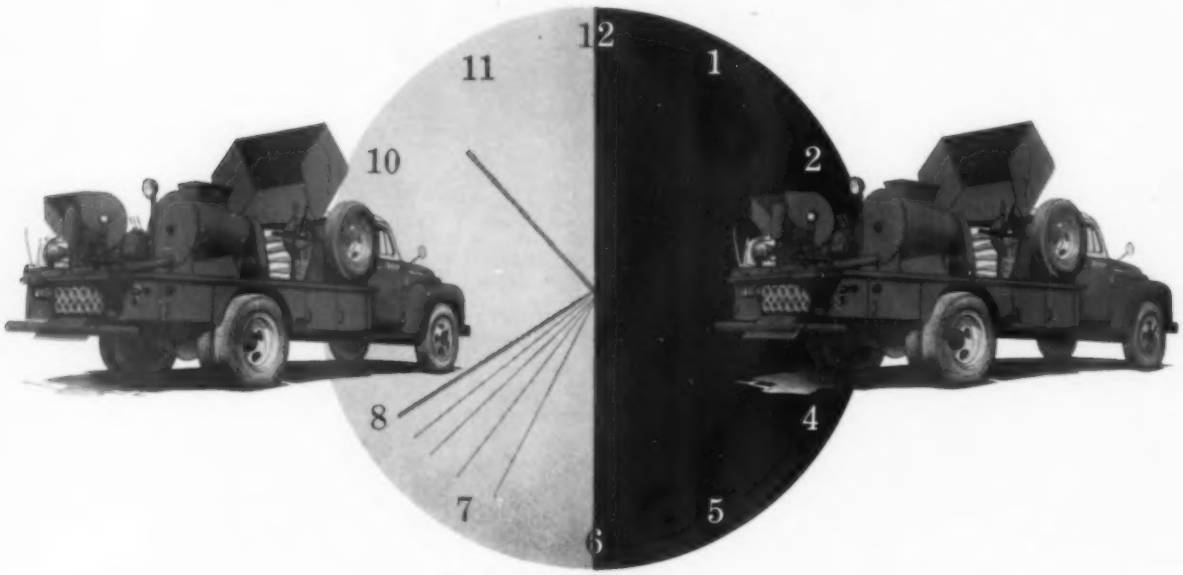
"WISE IN THE WAYS OF METAL BUILDINGS"

THE PARKERSBURG RIG AND REEL COMPANY
Division of Parkersburg-Aetna Corporation • Parkersburg, West Virginia

Fast Plugging, Bridging and Repair Service

is as close as your telephone

with **HALLIBURTON DUMP BAILER SERVICE**



Fast remedial service any time of day or night is just a quick phone call away from your well.

For plug back jobs, bridge plugs below damaged pipe, shot tamps, water shutoff, seal for bridge plugs, and many other jobs without cost of running pipe, your telephoned job order will be radioed to the nearest Halliburton Dump Bailer truck... Halliburton-designed and built for this specialized service.

New equipment, including special stuffing box and quick-change head, permits the operator to apply pressure for squeezing materials into the formation with the bailer still in the hole. Small knife-type Bailer bottoms permit Dump Bailer operations inside tubing.

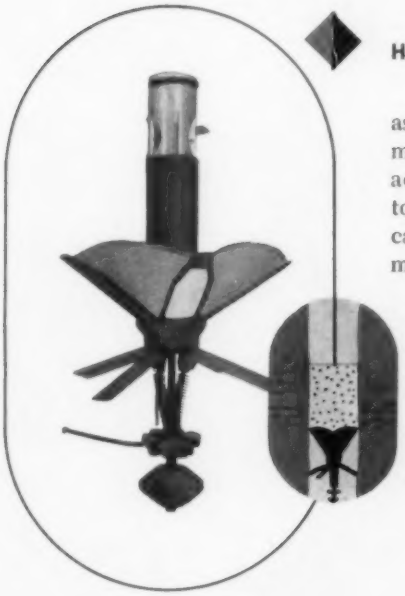
Save hours and dollars on your remedial cementing:..call Halliburton Dump Bailer Service whenever the need arises.

HALLIBURTON

OIL WELL CEMENTING COMPANY

DUNCAN, OKLAHOMA

Field-Tested Products that make Halliburton Dump Bailer Service Fast, Effective, Economical



Halliburton "DB" Bridging Basket

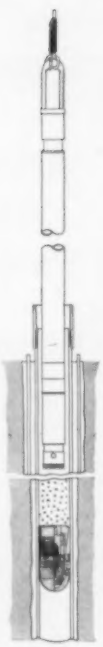
Forms a dumping bridge for cementitious materials. Widely used as an economical time-saver for bridging to assist in isolating formations, locating and repairing casing leaks, squeezing, perforating, acidizing, plugging to abandon or plug back work. Attached to Bailer section by special adapter, and lowered in open hole or casing. Pickup of Bailer sets and opens Bridging Basket and dumps material simultaneously.

Cal-Seal

A faster-setting gypsum cement ideally suited for temporary plugs. High compressive strength in one hour after setting. Low permeability. Readily drillable. Setting time can be accelerated or retarded to meet special conditions.

Hydromite

Waterproof plastic-base gypsum cement for plugging off bottom hole water in producing wells. Fluid phase sets up after being squeezed into formation, then expands linearly to form a tight, permanent, non-permeable seal around the plug. Especially effective for shutting off formation fluids or gases where regular cements fail to produce desired results.



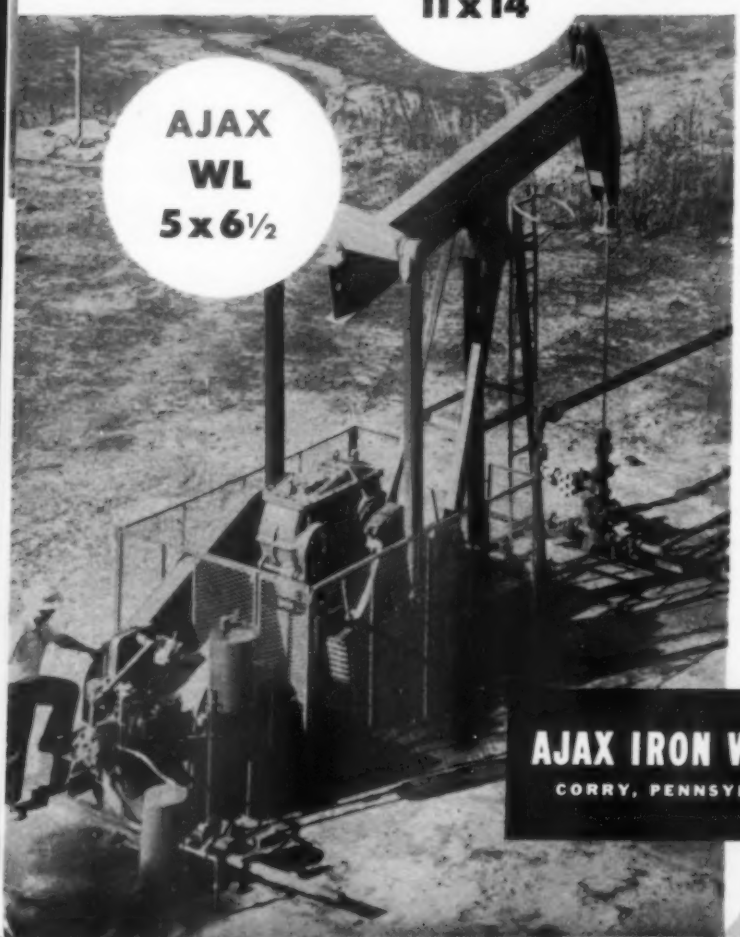
Halliburton Limit Plug

Forms bridge in casing to stop or limit the downward movement of well fluids and materials placed by Dump Bailer. Drillable. Designed to resist squeeze pressure from above, up to 2,000 psi. Run in on wire line and set by powerful spring and latch.

DUMP BAILER SERVICE

251 SERVICE CENTERS — JUST MINUTES AWAY FROM YOUR RIG

AJAX
DP-70
11 x 14



AJAX
WL
5 x 6½

IN

Ajax ENGINES

LARGE or SMALL—

The payoff is in the performance

AJAX Gas Engines make money by the day because they cost less to run by the hour —and they pay for themselves every two or three years! This is the kind of performance only AJAX *and gas* can deliver.

• You owe it to your pocketbook to get the actual facts. Your Supply Man has the figures you need covering the complete range of AJAX Gas Engines—ask him to present them, promptly.

AJAX

AJAX IRON WORKS
CORRY, PENNSYLVANIA

Builders of GAS AND OIL ENGINES, PRESSURE PUMPS, STEAM DRILLING ENGINES, INDUSTRIAL STEAM ENGINES

Oil Field Distributors: THE NATIONAL SUPPLY CO., PITTSBURGH, PA.
R. B. MOORE SUPPLY CO., BOLIVAR, N.Y.
BETHLEHEM SUPPLY CO., TULSA, OKLAHOMA

A NEW APPLICATION GUIDE

by Century to help you select Electric Motors

This handy Guide is carefully planned to make it easy for you to select electric motors for all popular applications. Using the convenient tables inside, you simply start with the equipment or machinery you want to drive.

Then, you identify the character of the load, starting and running torques, frame type, speed, etc., to arrive at precisely the right motor for your specific application. In just a few moments you know the motor type you need, the dimensions and other pertinent data.

Because Century offers a complete line, this handy manual will guide you to the right motor for your application. Obtain your own copy of this 12-page reference manual.

MAIL COUPON TODAY FOR YOUR FREE COPY

CENTURY ELECTRIC COMPANY
1806 Pine St., St. Louis 3, Mo.

Please send me the new Century Application Guide CE-99.

Name.....

Company.....

Address.....

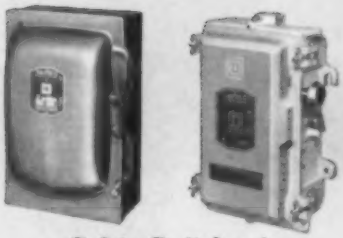
City.....Zone.....State.....

99

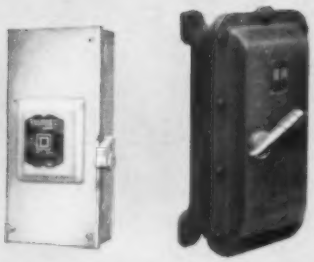
Performance-Rated ©
MOTORS
1/20 to 400 HP

C CENTURY ELECTRIC COMPANY

1806 Pine Street • St. Louis 3, Mo. • *Offices and Stock Points in Principal Cities*

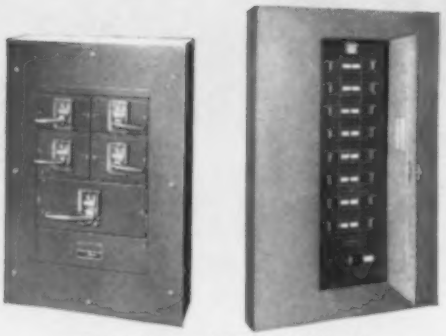


• Safety Switches in General Purpose and Special Purpose Enclosures



• Industrial Circuit Breakers in General Purpose and Special Purpose Enclosures

• Voltage Testers

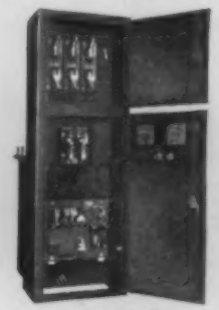


• Fusible and Circuit Breaker Lighting and Power Panelboards

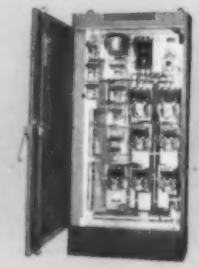
• Power Distribution Switchboards and Switchgear

Wherever Electricity

• Busways and Wireways



• EC&M High Voltage Synchronous Starters



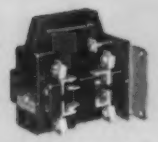
• Special Purpose Control

• Control Centers

SQUARE D COMPANY

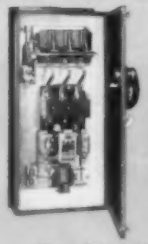
• A.C. Manual and Magnetic Starters in General Purpose and Special Purpose Enclosures

• Limit Switches

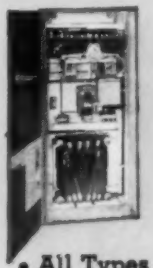


• Control Relays

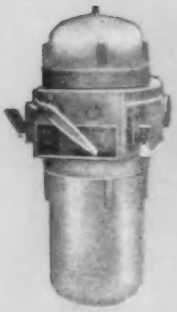
• Timing Relays



• Combination Starters in General Purpose and Special Purpose Enclosures



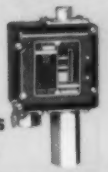
• All Types of Reduced Voltage Starters



• Starters for Hazardous Locations

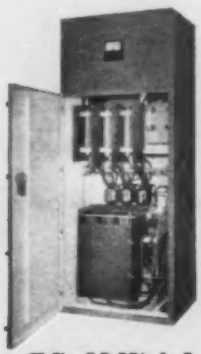
• Pushbuttons

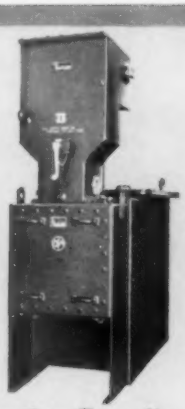
• Oil Field Pumping Plant Panels



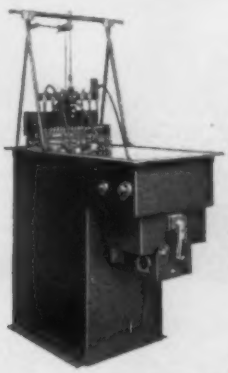
• Float & Pressure Controls for Pumps & Compressors

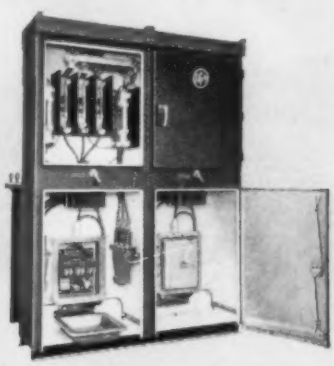
is Distributed and Controlled





• EC&M High Interrupting Capacity Starters. Air-Break *(left)* and Explosion-Resisting *(right)*





• EC&M 2200-4800 Volt Starters for Division 2 Hazardous Locations

DESIGN LEADERSHIP FOR MORE THAN 50 YEARS

the LUFKIN formula

FOR SELECTING THE RIGHT PUMPING UNIT FOR YOUR WELL . . .

$$S_p = 35E + \sqrt{F^2 + M^2} + Q + P_e + f^{max}$$

E - EXPERIENCE, YEARS.

F - MODERN MANUFACTURING FACILITIES

M - UP TO DATE METHODS

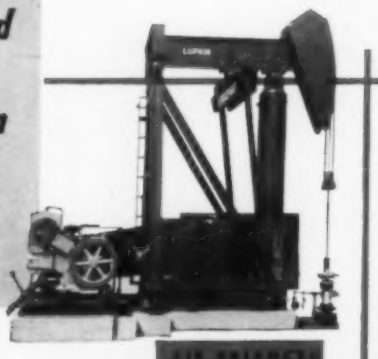
Q - BEST QUALITY MATERIALS

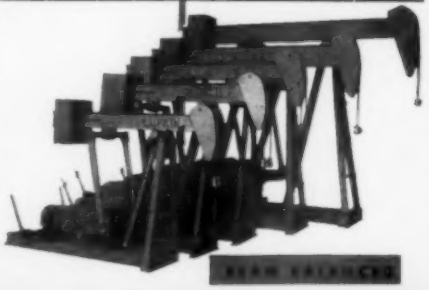
P_e - SOUND ENGINEERING PRACTICE

f^{max} - LARGE SAFETY FACTORS.

S_p - *SUPERIOR PUMPING UNITS*

There's always a standard LUFKIN unit with the right combination of beam capacity, counterbalance and peak torque for your well . . .



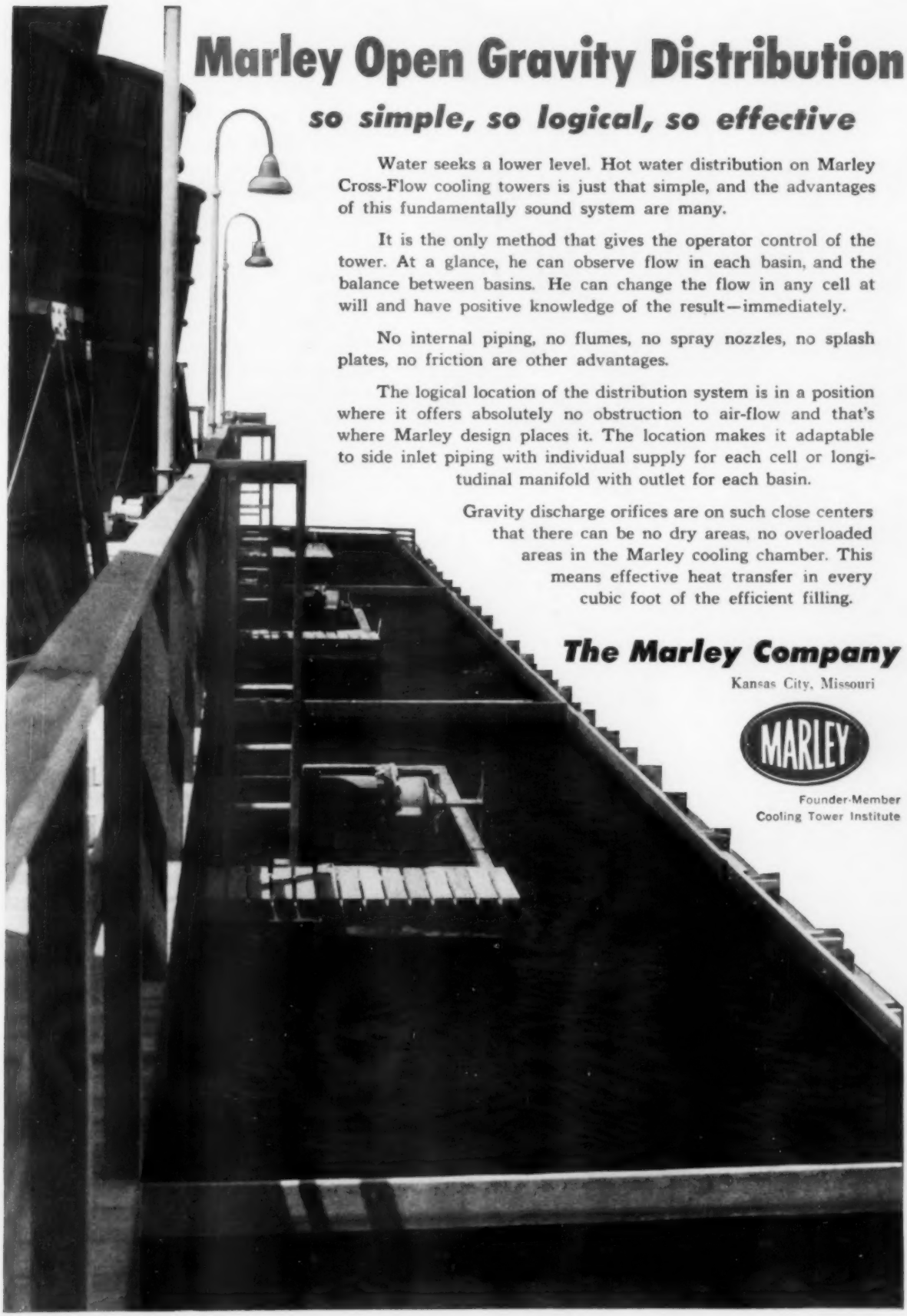


Lufkin FOUNDRY & MACHINE COMPANY

LUFKIN, TEXAS

Branch Sales and Service: Houston • Natchez • Corpus Christi • Lafayette • Dallas • El Dorado • Kilgore • Odessa • Hobbs Midland • Pampa • Wichita Falls • Los Angeles • Bakersfield • Effingham • Casper • Denver • Sidney • Great Bend Oklahoma City • Seminole • Tulsa • New York • Maracaibo, Venezuela

Lufkin equipment in Canada is handled by
THE LUFKIN MACHINE CO., LTD., 9950 65th Avenue, Edmonton, Alberta, Canada, Regina, Saskatchewan, Canada



Marley Open Gravity Distribution

so simple, so logical, so effective

Water seeks a lower level. Hot water distribution on Marley Cross-Flow cooling towers is just that simple, and the advantages of this fundamentally sound system are many.

It is the only method that gives the operator control of the tower. At a glance, he can observe flow in each basin, and the balance between basins. He can change the flow in any cell at will and have positive knowledge of the result—immediately.

No internal piping, no flumes, no spray nozzles, no splash plates, no friction are other advantages.

The logical location of the distribution system is in a position where it offers absolutely no obstruction to air-flow and that's where Marley design places it. The location makes it adaptable to side inlet piping with individual supply for each cell or longitudinal manifold with outlet for each basin.

Gravity discharge orifices are on such close centers that there can be no dry areas, no overloaded areas in the Marley cooling chamber. This means effective heat transfer in every cubic foot of the efficient filling.

The Marley Company

Kansas City, Missouri

MARLEY

Founder-Member
Cooling Tower Institute

DRILOIL

NEW OIL BASE MUD

Now: DRILOIL, an oil base mud you can mix and use in any oil field. Easily mixed right at your rig; needs no special equipment. Five years' development and field testing prove its superiority. Positive protection to all formations from water damage. Available immediately through Baroid distributors.

NO CONTAMINATION PROBLEM

DRILOIL oil base mud is not damaged by salt, anhydrite or cement. Tolerates up to 60% or more salt or fresh water by volume.

EASY TO SPOT OR PUMP

No thickening at the oil-water interface when spotted in hole containing water base mud. Perforating guns and other wireline tools can be run easily.

PRICED COMPETITIVELY

Material costs are competitive. Mud costs are less when mixed at the rig with locally available oils.

MIX AT YOUR OWN RIG

DRILOIL is a free-flowing powder in 100-lb. bags. Mud properties can be easily varied utilizing available mud additives.

When you buy Baroid — you buy the best!

BAROID DIVISION • NATIONAL LEAD CO.
P. O. Box 1675, Houston 1, Texas
Please send me your latest literature on DRILOIL.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

OGJ

BAROID

BAROID DIVISION NATIONAL LEAD CO.
Main Office: P. O. Box 1675, Houston 1, Texas

Always, at SKF, you will receive unbiased advice

because

– All four basic types of anti-friction bearings are available from **SKF**.

because

– They offer an extraordinarily wide range of sizes and combinations to meet virtually any requirement.

because

– Their long experience in the widest variety of bearing applications is your assurance of receiving sound recommendations.

because

– Thousands of manufacturers have been using the **SKF** Bearing Advisory Service for many years – always with good results. This dependable service is available to you, too. 7754

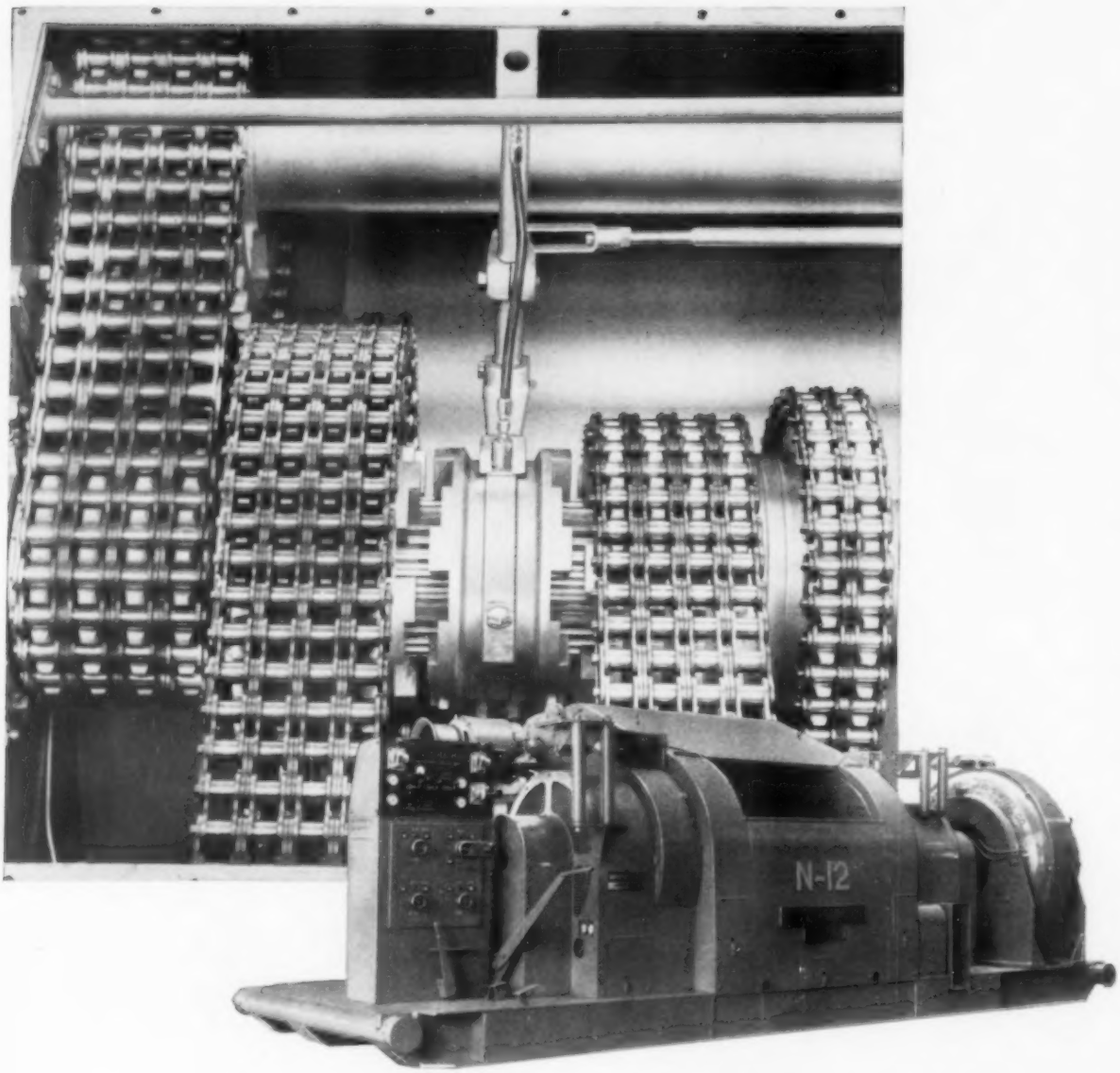
SKF®

EVERY TYPE—EVERY USE

- *Ball Bearings*
- *Cylindrical Roller Bearings*
- *Spherical Roller Bearings*
- *Tapered Roller Bearings* ("Tyson")

*Reg. U.S. Pat. Off. Tyson Bearing Corporation

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.



There's good chain in this Brewster

Brewster chose Rex Chain for this drawworks because Brewster demands standards of performance that Rex is able to meet.

Basically these standards add up to a long life of profitable drilling in an exacting service where profits must be watched closely.

Part of the profit will be realized in the elimination of unnecessary down time. The "glide fit" design of Rex Roller Chain makes assembly and disassembly fast and easy.

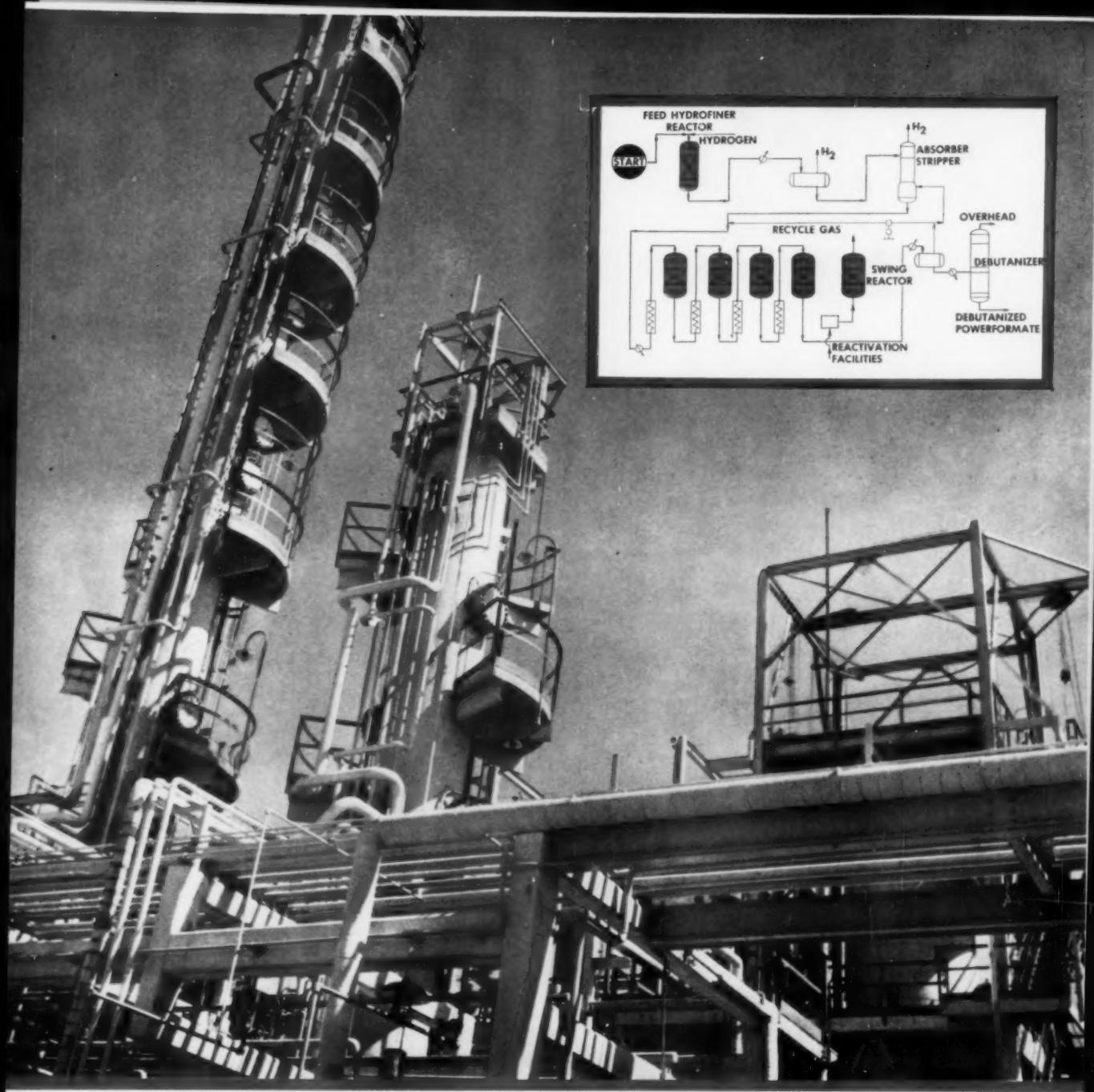
More of the profit will be realized from the always continuing program of product improvement which is a CHAIN Belt tradition. There is no roller chain stronger and more resistant to wear and fatigue than today's Rex.

In drilling service, Rex Roller Chain is convenient—enduring—and profitable. See your supply store. CHAIN Belt Company, 4619 West Greenfield Avenue, Milwaukee 1, Wisconsin.

CHAIN BELT COMPANY

Milwaukee 1, Wisconsin

Oil Field Offices: Dallas • Houston • Los Angeles • New York
Export Offices: Milwaukee • New York



POWERFORMING PROCESS CAN INCREASE YOUR HIGH OCTANE YIELD

Esso Research and Engineering Company offers you *Powerforming*, the most versatile platinum reforming process ever developed. *Powerforming* is another achievement of the Esso Research program – 37 years of new process developments which have been made available to refiners around the world.

Heart of the *Powerforming* process is a new, more active platinum catalyst. High activity over a long life is assured by significant new regenerative techniques. With this new process, good yields of 100 octane clear Powerformate can even be obtained from paraffinic stocks. Three *Powerforming* installations are on stream; eighteen are in the planning or construction stage. Licensees enjoy benefits of continuing *Powerforming* research. We would welcome your inquiry on the part *Powerforming* can play in *your* modernization plans.

ESSO RESEARCH AND ENGINEERING COMPANY

15 West 51st St., New York 19, N. Y.

Your key to progress... an Esso Research process

J&L EXTREME LINE CASING

for deep wells

- High strength joint
- 100% leak resistant

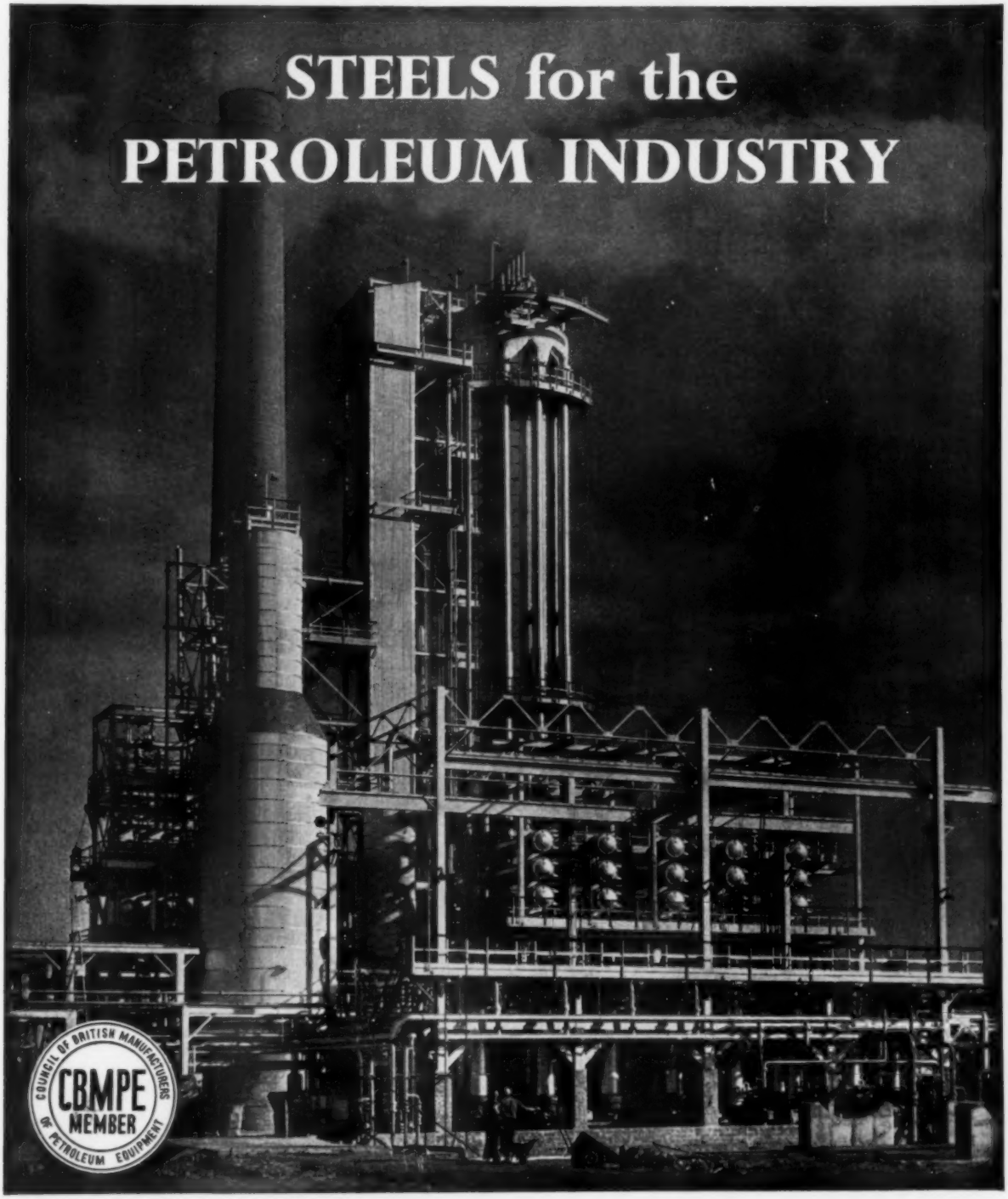
J&L Extreme Line casing meets the challenge of your toughest deep well problems. Check the unusual advantages of this new J&L casing available in grades J-55, N-80 and P-110. Produced under license from The National Supply Co. Write to Jones & Laughlin Steel Corp., 3 Gateway Center, Pittsburgh 30, Pa.

High joint strength. A modified Acme-type (rectangular thread form) thread with a steep flank angle assures a strong interlock, takes tensional loads in shear.

100% leak resistant. Separate sealing surfaces lock together when two lengths of casing are joined. Seal consists of a curved surface extending beyond the male threads and a tapered conical seat beyond the inside end of the mating female threads. The number of threaded connections is halved.

J&L STEEL **Jones & Laughlin** ...a great name in steel

THE UNITED STEEL COMPANIES LIMITED, SHEFFIELD, ENGLAND



"A Symphony in Steel"—A British Petroleum Company photograph.

THE UNITED STEEL COMPANIES LIMITED, SHEFFIELD, ENGLAND

APPLEBY-FRODINGHAM STEEL COMPANY · SAMUEL FOX & COMPANY LIMITED · UNITED COKE & CHEMICALS COMPANY LIMITED
STEEL PEECH & TOZER · UNITED STEEL STRUCTURAL COMPANY LIMITED · WORKINGTON IRON & STEEL COMPANY
DISTINGTON ENGINEERING COMPANY LIMITED · OWEN & DYSON LIMITED · YORKSHIRE ENGINE COMPANY LIMITED

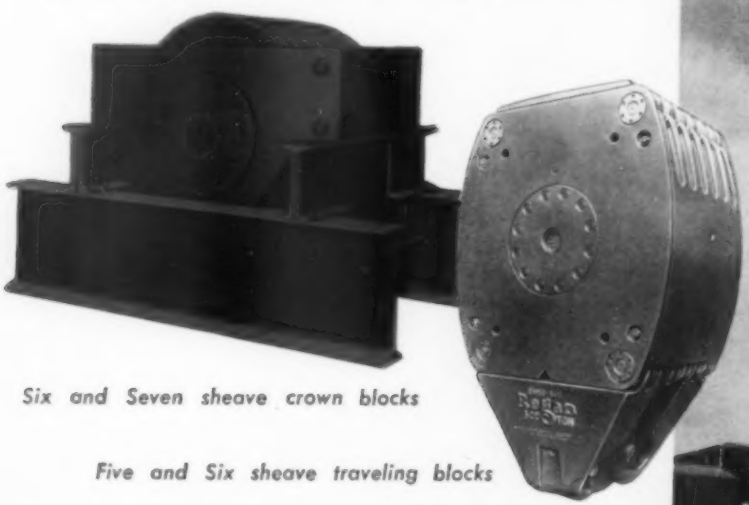
THE UNITED STEEL COMPANIES LTD

US 106

Regan Type M Blocks
with 50" sheaves

To Speed Drilling . . .
Reduce Wire Line Wear

Type M Regan crown and traveling blocks were designed for "double extra heavy" service, and feature dual bearings plus ball thrust bearing for each cast-steel flame-hardened-groove sheave. This insures long life and even wear in grooves, and minimum wire line wear. The Type M "traveler" is a real heavyweight, with low center of gravity for true running, fast falling blocks, and even line spooling on drum. Individual sheave beams in crown and traveler carry sheave loads and give additional rigidity to each block. Lubrication system is from either side — positive to each bearing and includes extra capacity reservoir. For your "XX Heavy" jobs, use Regan M Blocks. For further information and sure supply, "Around the Clock— Around the World", call your Mid-Continent representative.



Six and Seven sheave crown blocks

Five and Six sheave traveling blocks

EXCLUSIVE DOMESTIC AND EXPORT DISTRIBUTOR

Export Division: 45 Rockefeller Plaza, New York 20, N. Y., Cable: MIDCUMPORT NYK

MID-CONTINENT
Supply Company
MID-CONTINENT BLDG. FORT WORTH, TEXAS

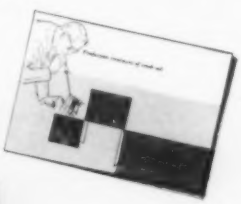
THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

Service and thoroughness cut your dehydration costs

Breaking crude oil emulsions can cost less, when you're using the right *emulsifier* in the right *way*.

It takes a lot of experience and a lot of testing to find the best way to demulsify and the best chemicals to do the job. That's why Aquaness field men check and re-check, until they come up with the best demulsifier answer to your specific problem. They're not satisfied until they find the most effective and economical Aquaness demulsifier for your emulsion.

Aquaness thoroughness pays off for you, in lower chemical costs, in conservation of light ends, and in consistent adherence to pipeline standards. Have a test made at your well, by calling your local Aquaness Representative.



Write for a copy of the Aquaness booklet, "Production Treatment of Crude Oil."

Aquaness
Department
ATLAS POWDER COMPANY
2005 Quitman Street, Houston 26, Texas

ANNOU

Increased capacity ratings

THE Timken Roller Bearing Company announces an increase in the capacity ratings of most series of Timken® tapered roller bearings. Increases range up to 39%. Most are in the neighborhood of 10%. Some are negligible.

Permits Use of Smaller Bearings

This increase in capacity ratings makes it possible for many of you to use smaller bearings. Your products can be made more compact. You can save weight. You may be able to reduce the size of your shafts and housings. And you may be able to use Timken bearings in new applications where they have not been practicable in the past.

3 Reasons for Increases

What led to these increases in Timken bearing capacities? Three things: First, a careful review of more than 6,000 different laboratory studies

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

NCING!

for Timken® bearings

of Timken bearing performance on fatigue life machines. From these exhaustive studies, conducted on an organized, scientific basis since 1924, we keep learning more and more about predicting bearing life.

Second, refinement in the method of analyzing these studies mathematically.

Third, a careful review of the life of millions of Timken bearings in the field.

How Much Can This Save *YOU?*

To find out how the new capacity ratings affect the types and sizes of Timken bearings in which you are interested, call your Timken bearing representative or write our Engineering Department. We'll be glad to work with you at the drawing board stage. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TAPERED ROLLER BEARINGS ROLL THE LOAD

Weighs only 22 pounds

CENCO®'S NEW PORTABLE

Karl Fischer Moisture Determinator

This compact, self-contained instrument utilizes the popular Karl Fischer method of water content determination. It is extremely useful for spot checks at field stations or control points as well as for permanent use in small laboratories and quality control installations.

Analyses of liquid, solid and gaseous samples are possible without removing the basic apparatus from the case. Samples may be measured from a few parts per million to over 50% water. Accuracy of determinations varies from plus or minus 10% in the 0 to 100 parts per million range to plus or minus 0.2% in the higher ranges.

The unit is quickly and easily set up and plugs into any 115 volt, 60 cy. circuit. Order today or write for Circular No. 1278.

No. 26800 Moisture Determinator with case but without pipettes or chemicals **$472.50**

Made under license by Phillips Petroleum Company

cenco
The most complete line of scientific instruments and laboratory supplies in the world
RS

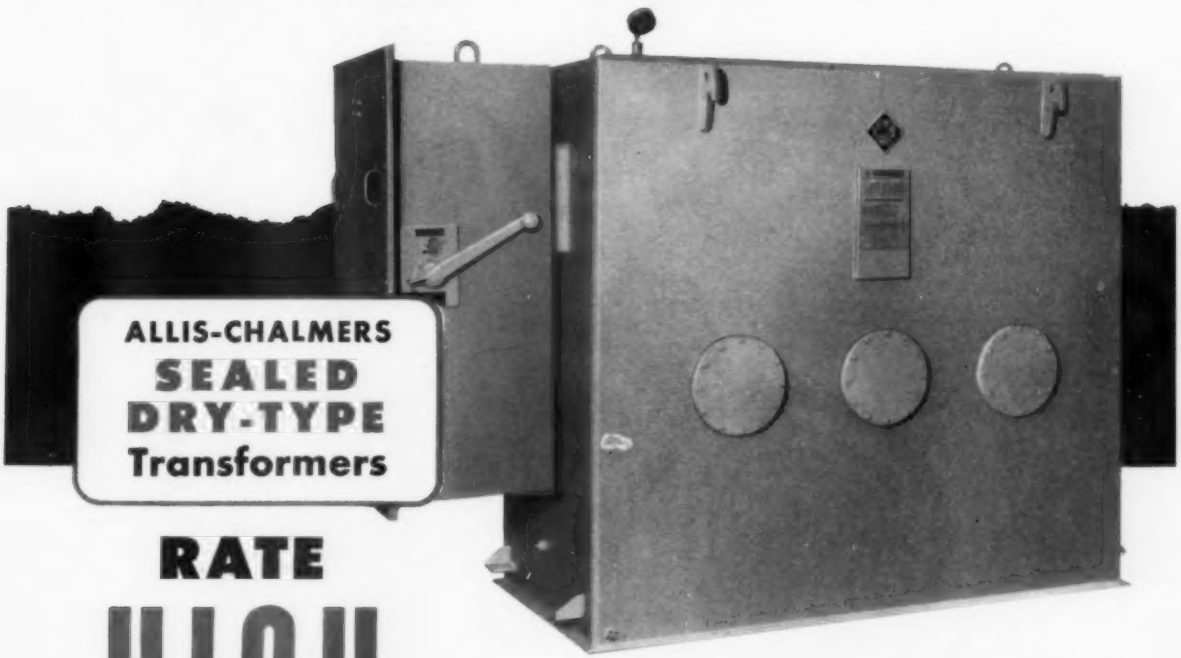
CENTRAL SCIENTIFIC COMPANY

General Offices and Factory—1724 Irving Park Road • Chicago 13, Illinois

Branches and Warehouses—Mountainside, N. J. • Boston • Birmingham
Central Scientific Co. of California—Santa Clara • Los Angeles
Refinery Supply Company—Tulsa • Houston
Central Scientific Co. of Canada, Ltd.—Toronto • Montreal • Vancouver • Ottawa

We asked utilities and industrial users:

"What type transformer do you prefer for plant service, station auxiliary and load-center applications?" Sealed dry-type units rated number one in five basic categories of operation and operational cost. For all the facts, see your Allis-Chalmers representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



RATE HIGH

with Operators ...ON EVERY COUNT

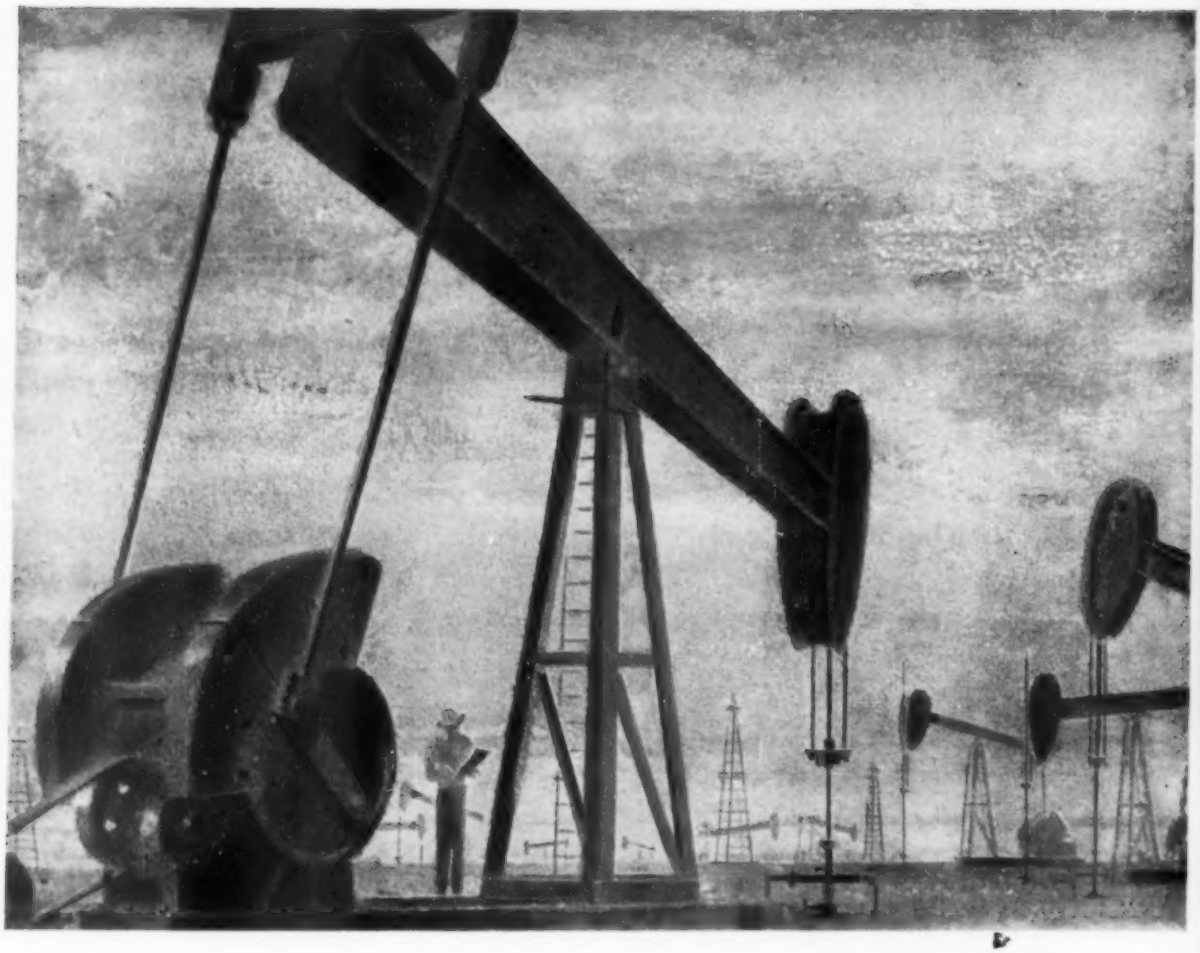
	Sealed Dry Type	Open Dry Type	Askarel Filled	Oil Filled
INSTALLATION COST	1	3	2	4
LOCATION VERSATILITY	1	2	3	4
SAFETY	1	3	2	4
RELIABILITY	1	2	1	1
MAINTENANCE	1	3	2	2

Types rated in order of Preference

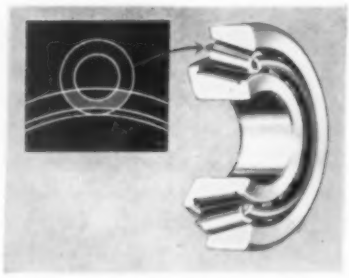
- **Installation Costs**—Your Allis-Chalmers sealed dry-type transformer is ready to be energized immediately upon shipment, or may be stored indefinitely until needed.
- **Location Versatility** — It can be located indoors or outdoors, overhead or underground — in flood areas, dirty and contaminated atmospheres — no special precautions need be taken.
- **Safety** — No fire or explosion hazard. Transformer unit is hermetically sealed in inert dry nitrogen gas.
- **Reliability**—Performance is unparalleled. Contaminants and moisture cannot enter case to affect service. Oxidation of insulation materials cannot take place.
- **Maintenance**—Upkeep is virtually eliminated. No liquids to maintain. No need for periodic cleanout of core and coil. Plain tank shell is easy to paint.

ALLIS-CHALMERS

A-5328



Built to stand up . . . under 'round-the-clock pressure!



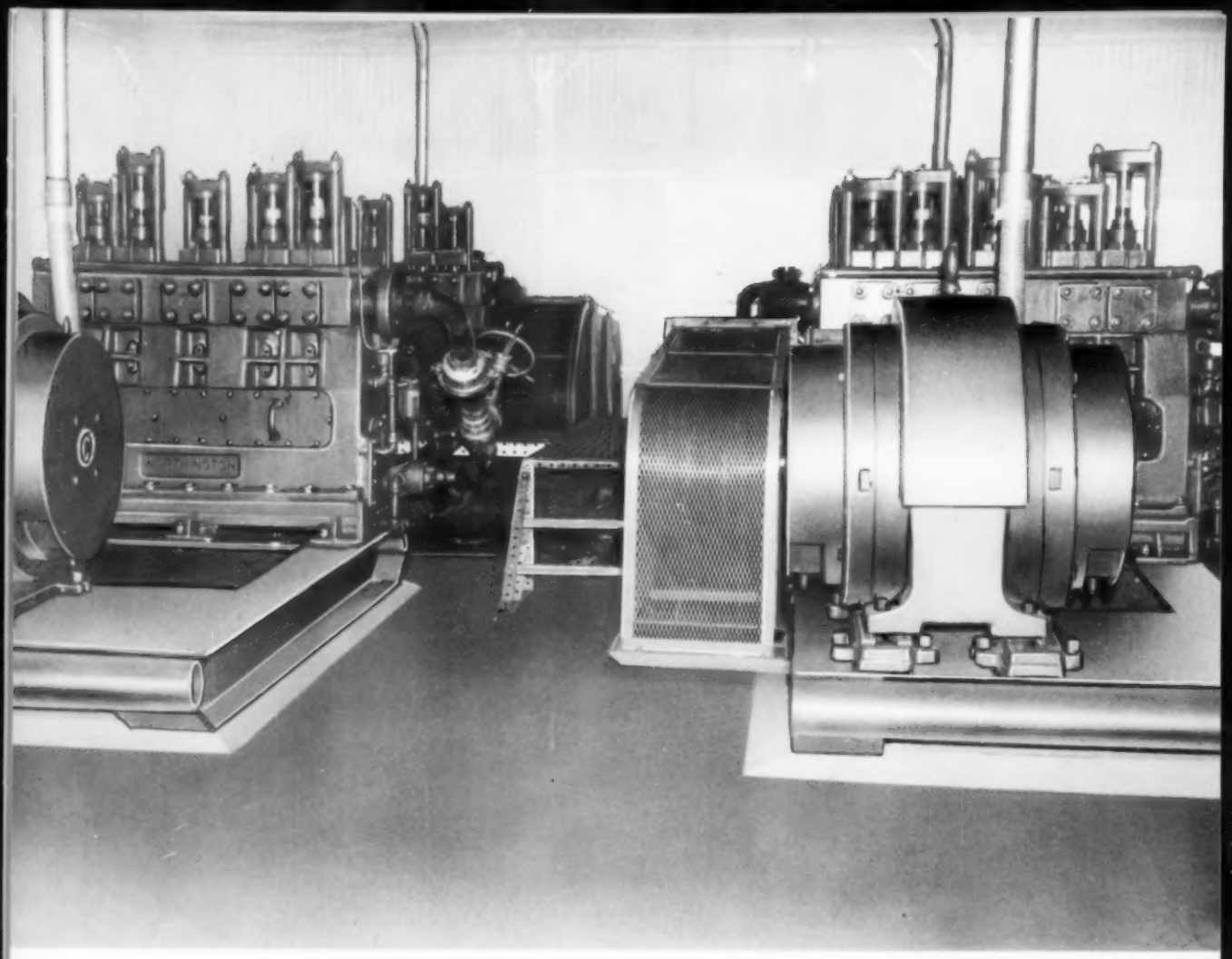
HIGHER FLANGE IMPROVES ROLLER ALIGNMENT

As shown by the gray area above, the higher flange provides a large two-zone contact area for the roller heads. This greatly reduces wear—practically eliminates "end play". Larger oil groove provides positive lubrication.

The flow of America's vital oil can't be regulated by a time clock! These bobbing pumps work around the clock, around the year—with virtually no attention whatever! Dependable Bower Roller Bearings are more than proving their ability to stand this back-breaking pace—doing it with a minimum of maintenance cost and down-time. That's because important Bower Spher-O-Honed design features, like the one shown at left, have reduced bearing failure to a rarity. Whatever test *you* put them to—tractors, machine tools, jet engines—you'll find that Bower Spher-O-Honed Bearings will last longer and operate more efficiently. Let a Bower engineer show you the many advanced design features and superior quality of the complete Bower line. There are tapered, straight and journal roller bearings for every field of transportation and industry.

BOWER ROLLER BEARING DIVISION
FEDERAL-MOGUL-BOWER BEARINGS, INC. • DETROIT 14, MICHIGAN

BOWER ROLLER BEARINGS



Flooding

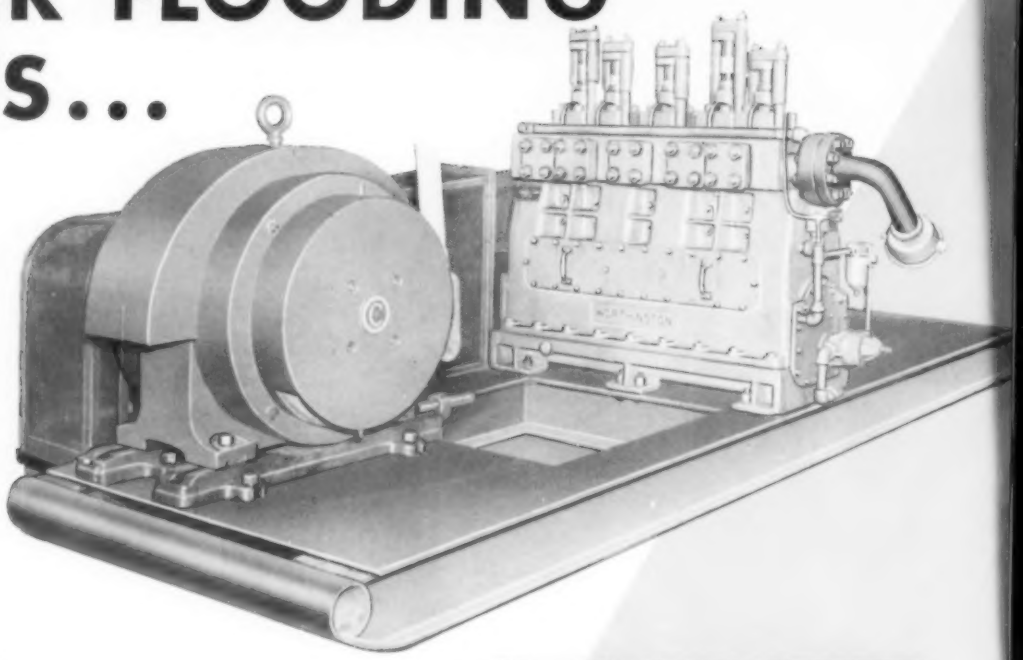
WITH J&L SUPPLY

Water flooding is simplified and the over-all operation goes more smoothly with J&L co-operation. This is not an idle statement.

We have the know-how and equipment to design and build skid-mounted pump units to handle circulating, backwash or injection jobs with precise and economical efficiency.

We have the most suitable drilling and pumping equipment. Our J&L tubular goods include pipe *lined at the mill* with cement. Our supply service includes valves, fittings, meters, controls, pumps, motors, engines, feeders, tanks, filters — everything! Our store stocks for maintenance are complete and convenient. Our men understand your problems and earn your confidence.

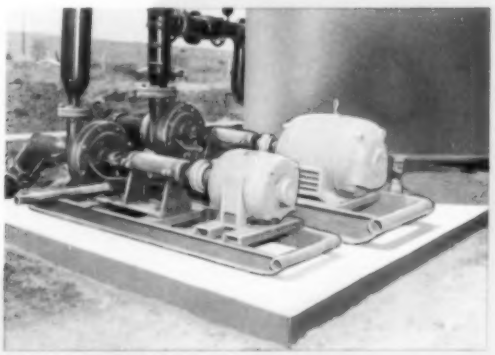
WATER FLOODING UNITS...

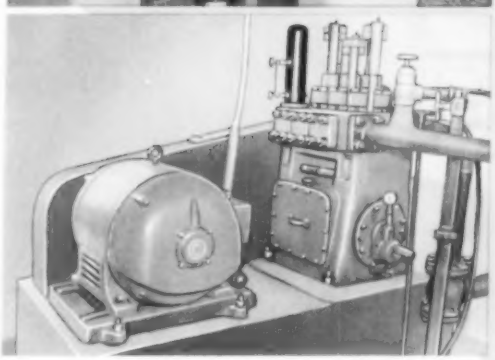


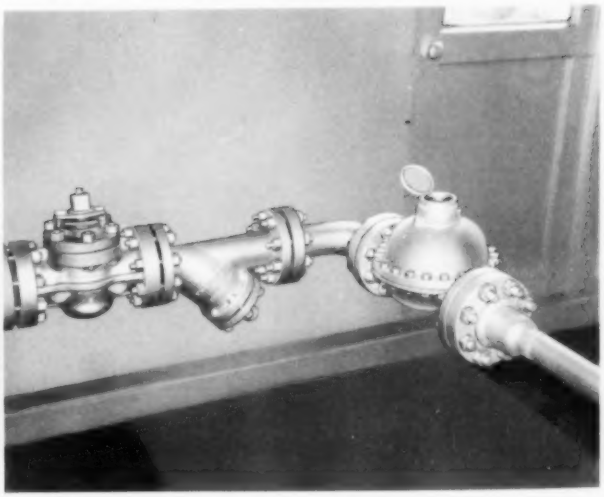
designed and built by J&L SUPPLY

If it's a job around any water flooding project that can be handled with any properly fitted rotary, centrifugal, piston, or plunger pump. . . . If it's important — and it always is — to power that pump with precisely the right engine or electric motor. . . . In other words, if you want the utmost in efficiency and economy in a pump unit, you'll want it designed and tailor-made by J&L Supply.

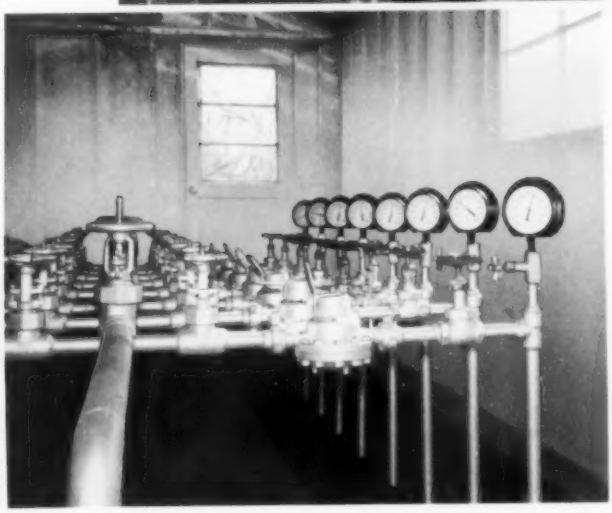
This tailored-to-measure service includes gas volume tanks, and pump, compressor and generator units for ANY oil country application. Call J&L Supply anywhere — our engineers will take over promptly.







If it's used in
WATER
FLOODING
your best source is
J&L SUPPLY



J&L Pipe
CEMENT LINED AT THE MILL

The lining of J&L Cement Lined Pipe is satin smooth, resulting in a lower friction coefficient and higher flow efficiency than for unlined pipe. Therefore, the carrying capacity is greater than steel pipe of the same I. D.

It is specifically designed, of course, for handling corrosive liquids.

It is ideal for flow lines, pipe lines, tubing and casing where salt water, hydrogen sulfide, carbon dioxide or other corrosives are present.

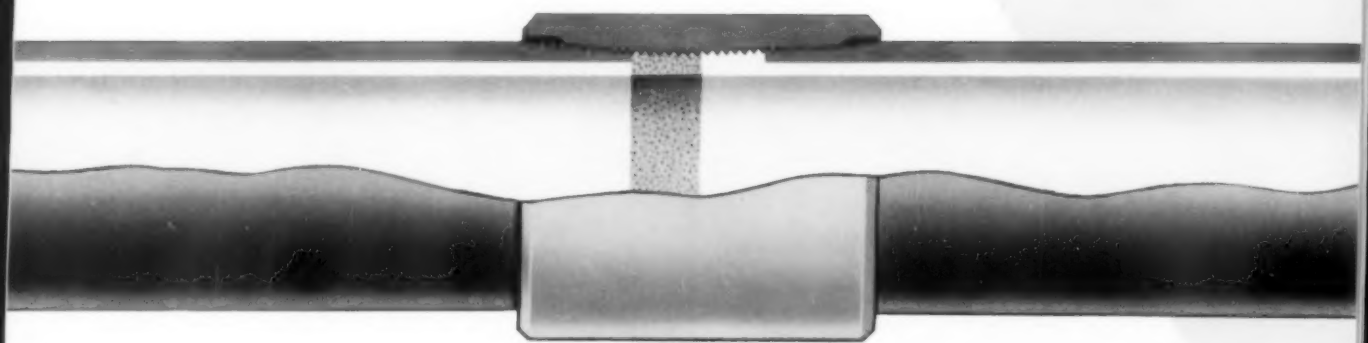
It is impervious to hot water that would cause tuberculation in ordinary pipe.

Fittings cement lined at the mill can be supplied — such as tees, ells, crosses, unions.

J&L Cement Lined Pipe requires no special handling. The satin-smooth lining withstands any exterior blow that does not dent or deform the steel.

Installation requires no special knowledge or skill. Field joints are made up with a sealing compound which is as corrosion resistant as the cement lining itself.

These joints can be made up and broken down as often as necessary. J&L pipe cement lined at the mill contributes materially to the success of water flooding. Discuss this with any J&L Supply man.



Jones & Laughlin

SUPPLY DIVISION – Tulsa

ACCO for Better Values

THE COMPLETE LINE—

R-P&C VALVES

DESIGNED FOR DEPENDABILITY

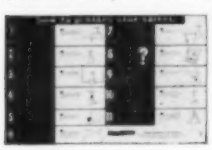
R-P&C FORGED STEEL GATE VALVES ARE NOW IMPROVED TO GIVE EVEN BETTER SERVICE

R-P&C Forged Steel Gate Valves, developed specially for the power, petro-chemical and process industries, are now better than ever. These dependable valves have been improved for greater safety, better performance and longer service life.

Illustrated above is a general purpose valve of the 800 Series; it is rated at 2500 PSI at 100° F., or 800 PSI at 850° F., and is furnished in eight sizes from ¼″ to 2″. It is available with either screw (F-56) end or socket weld (F-57) end, and with conventional and full port openings. Also available in flanged ends with conventional port openings in 150, 300 and 600 lb. with A.S.A. standard flanges and A.S.A. standard face to face. For details, write for Booklet DH-80.

The R-P&C Line is Complete

Whatever your valve requirements may be, *look first to your R-P&C Distributor.* The R-P&C Valve line includes gate, globe, angle and check valves in all standard valve materials—bronze, electric iron and cast steel, as well as the forged steel line described above. An exceptionally wide range of styles, sizes and pressure classes is available. In addition, R-P&C offers a full line of cast steel fittings, also specialties such as asbestos-packed cocks, bar stock valves, Lubrotite gate valves and other items. Order through your R-P&C Distributor. For complete R-P&C catalog, write our Reading office.



FREE WALL CHART
"How to Protect Your Valves"
Installation pointers, operating tips, clues to longer valve life. They are all on this 22″ x 17″ wall chart. Write for your free copy.

R-P & C VALVE DIVISION
AMERICAN CHAIN & CABLE

Reading, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

ACCO

Most powerful, most economical V-8's

One of 9 reasons why oil men find International Trucks cost least to own!

Costs go down, profits go up with new INTERNATIONAL V-8's that have the highest horsepower in any commercial truck.

You have the power to get started and to keep moving . . . more miles per gallon on regular gasoline. Average speeds are higher with less shifting. You have ample power for all auxiliary equipment.

This is another example of INTERNATIONAL's policy to build the best truck—to use only the finest parts and components with quality construction throughout—to spend more to build the truck so that it costs you *least* to own!

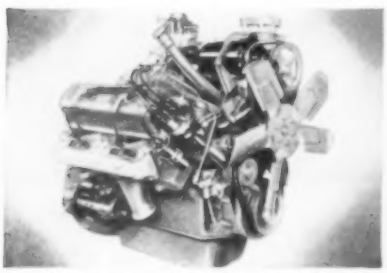
And INTERNATIONAL Trucks *do* cost *least* to own. This has been proved* by detailed fleet cost records.

Follow the lead of the men who know trucking costs to a penny . . . fleet operators who have made INTERNATIONAL the heavy-duty sales leader for the past 25 years. Make your next truck an INTERNATIONAL.

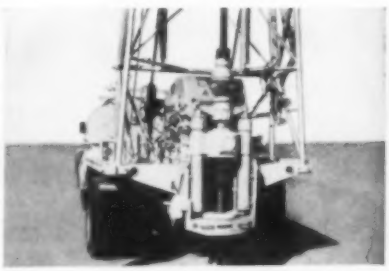
*Signed statements in our files, from fleet operators throughout the U.S., back up this statement.

INTERNATIONAL HARVESTER COMPANY, CHICAGO

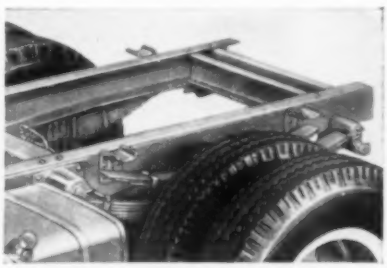
Motor Trucks • Crawler Tractors
Construction Equipment • McCormick® Farm Equipment and Farmall® Tractors



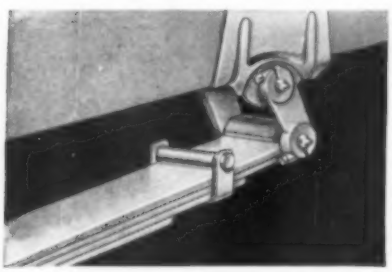
1 **Most powerful V-8's,** up to 257 hp. Highest *usable* horsepower and torque at safe, economical rpm. These *truck* engines are built for lasting, superior performance and low maintenance costs . . . greater fuel economy on regular gasoline.



2 **Dependable stationary power,** such as auger drill shown above. New V-8's are available with increased cooling, oil coolers and other equipment to keep the engine operating at peak efficiency, longer. LPG system offered as factory equipment.



3 **Rugged frame** has plenty of sturdy crossmembers. Non-crystallizing, cold squeezed rivets are used for extra rigidity and proper flexibility on all types of service. Husky front and rear sections add to the safety margin built into every frame.

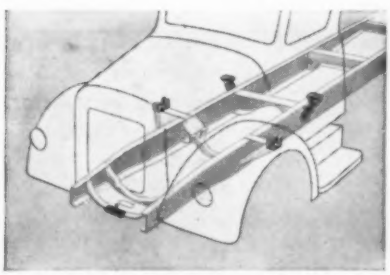


4 **Cradle action front and rear springs** cushion load and driver. Proper design and mounting provide better load support, smoother riding and longer spring life. Rear-shackled front springs for greater stability and increased life.

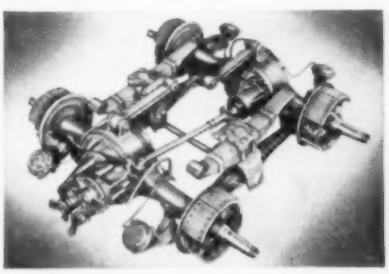
5 **Full torque power take-off.** INTERNATIONAL offers sturdy, low cost top-mounted power take-offs as factory installed options. You get full use of engine power in all transmission output speeds to adequately power auxiliary equipment.

6 **Safer, easier steering** and greater maneuverability result from cam and twin lever gears with controls mounted *ahead* of front axle. Steering wheel is comfortably positioned. Power steering available on most models.

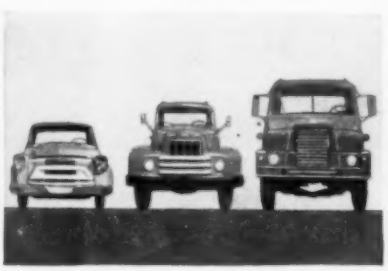
New INTERNATIONAL V-Line trucks are powered by three great new V-8 engines, 206, 226 and 257 hp. Approved clean-burning LPG system also available. Offered in conventional and COE design, 4-wheel and 6-wheel models with GVW ratings from 24,000 to 60,000 lbs., up to 65,000 lbs. GCW. You name the job, INTERNATIONAL has the truck exactly right for your own hauling operation . . . "sized," powered and geared to cost you *least* to own.



7 For cab comfort and long life. Quiet, level ride without transmitting stress to cab, fenders, hood or radiator. It's the result of wide spaced, rear shackle type cab mountings plus exclusive INTERNATIONAL 5-point rubber-insulated suspension.



8 INTERNATIONAL tandems give longer, more dependable life. This unit has rubber bushings at all 10 oscillating points to reduce maintenance and lengthen life. Third differential with lock transmits power smoothly and evenly to each axle.



9 World's most complete line. There is an INTERNATIONAL "tailor-made" for every truck job, ½ tonners to 96,000 pounders. Choice of 4-wheel, 6-wheel and all-wheel-drive models, conventional and COE design. Every one built to cost *least* to own.

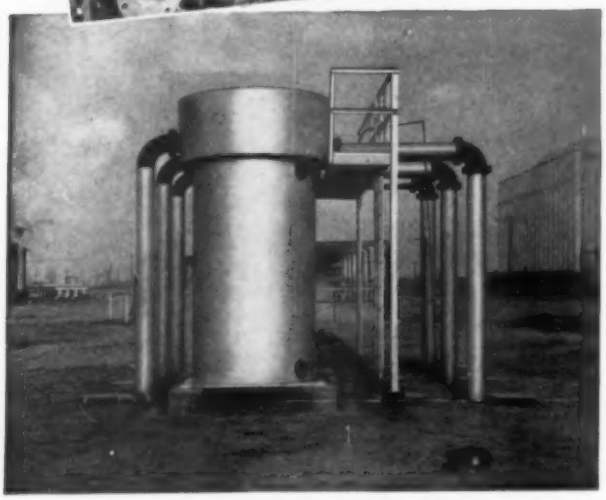
Dirty Water can't "Shut-down"...

Vogt

film type exchangers

(Condensers—Coolers—Evaporators)

Patent Nos. 1,935,270 - 2,057,597 - 2,424,441



River water, well water or brackish water are all alike to this exchanger *because it can be cleaned* while in operation! The water distributing ferrules need only be removed successively for the cleaning brush or tool whereby the tubes receive additional water which sluices away the dislodged dirt.

Vogt Film Type Exchangers are operating with real economy of first cost, operation and maintenance in power, petroleum, and chemical industries. They serve as Jacket Water Coolers, Feed Water Heaters, Hydrocarbon Evaporators, Sulphuric Acid Coolers, and Sulphur Dioxide Condensers, and can be designed to cool or heat any liquid and to condense or evaporate any fluid.

TOP: *Four units at Newton Falls, Ohio Municipal plant cool water for diesel engines and a lubricating oil cooler.*

BOTTOM: *Jacket Water Coolers serving engines of 7,300 HP in the compression plant of a Western Oil Refinery.*

[Bulletin HE-7 describes typical installations of Vogt Film Type exchangers and is available upon request. Dept. 24A-XO.]

HENRY VOGT MACHINE CO., LOUISVILLE, KY.

Branch Offices: NEW YORK, CHICAGO, CLEVELAND, DALLAS, PHILADELPHIA, ST. LOUIS, CHARLESTON, W. VA.

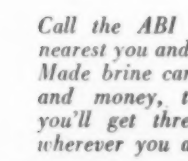
A silent partner
Is at work, too

Wise oilmen throughout the fields of Louisiana, Texas and Eastern New Mexico are taking in a new silent partner —super-saturated Ready-Made brine.

Their new partner is saving them money in workovers, completions, and drilling through salt sections.

Ready-Made brine is fully saturated and free of suspended solids. It won't hydrate shales and clays, and when used in drilling through salt sections, bit size holes are assured. Ready-Made brine is pure beyond the most rigid requirements. Because it is tank trucked directly to your location and made ready to use, it saves on costly time and labor involved in mixing sack salt and field water.

Call the ABI brine company nearest you and see how Ready-Made brine can save you time and money, too. With ABI you'll get three hour service wherever you are.



Associated Brine Industries

COMPANY	PRODUCING POINTS
Brine Service Div., Corpus Christi Salt Co	Beaumont, Tex.; Pine Prairie, La.
Brine Service Co.	Houston, Corpus Christi
Taland Brine Service, Inc.	Kermit, Tex.
The Brine Co.	Midland, Tex.; Hobbs, N. M.

They Say—

COST-imating series reprints

Dear Sir:

Reference is made to your booklet, entitled "Refining and Petrochemicals Article Guide," providing a ready reference of articles published during 1956 in The Oil and Gas Journal.

In this connection, information is desired as to whether reprints or magazine cutouts are available for certain of these articles, and if so, at what price.

The particular articles I am interested in are 5, 6, and 7 on Page 2 of the booklet, and 14, 15, 16, 17, 19, 20, 21, and 23 on Page 3. All of these articles pertain to "COST-imating" by W. L. Nelson.

L. A. Pelty
Project Coordinator
Olin Mathieson Chemical Corp.
Morgantown, W. Va.

Editor's note: Yes, the Journal's "COST-imating" series, authored by Prof. W. L. Nelson, is available in reprint booklet form. These can be ordered at $2 per copy from the Journal's Reader Service Dept., P. O. Box 1260, Tulsa.

Optimism at Tidewater

"There have been times in past years when the shadow of the oil industry giants darkened our outlook. So another benefit (of the Delaware refinery), at least psychologically speaking, is the fact that we now lead the pack. We've got a refinery the likes of which no other oil company in the world can boast. And it's a refinery of the future—the first in a new generation of refineries. The industry will be busy catching up for the next decade."

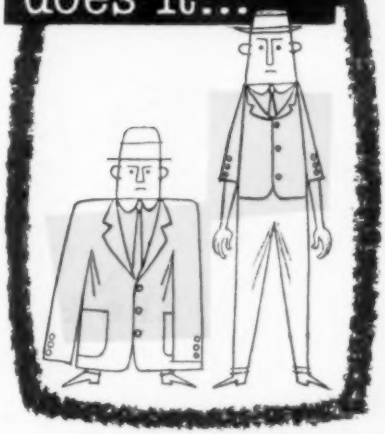
Editorial in the Tidewater Eastern Division News.

Versatile engineers needed

"Today (the engineer) must deal with sales, marketing, cost accounting, public relations, and other departments and sections . . .

"Management has the responsibility to provide the engineer with opportunity to advance, to produce, and to participate to the extent of his abilities and on an equal footing with others in the organization. But the engineer also has a responsibility to management which he must discharge if he ex-

no one coat does it...



one source does

Valdura offers maintenance paints made from specific resins for every condition

EPON

VAL-CHEM. Versatile, chemical resistant metal primer for use under any finish coat. VALPON ENAMEL. Prevents damage by oils, solvents, alkalies and other chemicals on wood, metal or masonry.

PARLON

PARAVAL ENAMEL. Not affected by acids, alkalies and other chemicals. Used on wood, metal, concrete or masonry. RUBBER BASE ENAMEL. Combines excellent exterior durability with high chemical resistance.

BAKELITE

SUPER SERVICE ENAMEL. Resists chemical, moisture and abrasive conditions on metal wood or masonry. ASPHALT ALUMINUM PAINT. 98% waterproof metal coat prevents rust, rot, corrosion. Highest reflectivity.

COAL TAR

SEWAGE DISPOSAL BLACKS. Used for protecting concrete and metal surfaces from water, etc., found in sewage plants, reclamation projects, refrigeration systems, metal and concrete pipe, marine exposures.

URETHANE

URAVAL. The very latest type of coating that combines the ultimate in resistance to chemicals, solvents, marring and abrasion. Uraval will stand up where all other types of coating have failed.

ALKYD

M & F ENAMEL (General Maintenance), VALKOTE (Implement Enamel), DARYWHITE. Products that utilize the outstanding durability of alkyd resins. All these coatings are hard, tough, quick drying and color retentive.

Valdura maintenance paints are stocked by leading industrial distributors everywhere!

VALDURA PAINTS THAT ENDURE

VALDURA
HEAVY DUTY
PAINT DIVISION
AMERICAN-MARIETTA CO.
101 E. Ontario St., Chicago 11, Ill.
687 Wellington St., Ottawa, Canada

PENDLETON
TOOL INDUSTRIES
INC.
Under this banner
the Proto Tool Company
will continue to serve
the needs of all industries
Founded in 1907, PROTO is the World's largest producer today of high-quality hand service tools. Leadership is attributable mainly to the professional quality of PROTO tools—resulting from intensive research, field-tested designs, special alloy steels, and superior manufacturing.
PROTO means
PROfessional
TOols!
PROTO TOOLS
DIVISION OF
50 YEARS
2209 SANTA FE AVE.
LOS ANGELES, CALIF.
583 ALLEN STREET
JAMESTOWN, NEW YORK

pects his career with a specific company to be successful.

"Management can only go so far in providing the engineer with the means to gain added knowledge and develop skills and abilities in his profession. The engineer must be willing to invest his time and effort to take advantage of the opportunities offered and to see others."

Williard F. Rockwell, Jr., president, Rockwell Manufacturing Co.

Another Canadian gas line?

"I believe there is every likelihood that within the next 5 years a third pipeline exporting gas from Alberta will be built.

"It is absolutely essential that no additional quantities of natural gas be permitted to be withdrawn from the province unless the permit is contingent upon the Alberta market having prior call upon the gas if it is needed for Alberta consumption. The Alberta consumer must have that protection.

"As the major supplier to the natural-gas consumers of this province, this is the stand that my companies (Northwestern Utilities, Ltd., and Canadian Western Natural Gas Co., Ltd.) will be taking before the Alberta Petroleum and Natural Gas Conservation Board at any hearings involving requests for new permits to export gas or to hear application for increasing the amounts allowed under existing permits."

Dennis K. Yorath, president, Canadian Western Natural Gas Co., Ltd., and Northwestern Utilities, Ltd., in a speech at the Canadian Gas Association annual meeting.

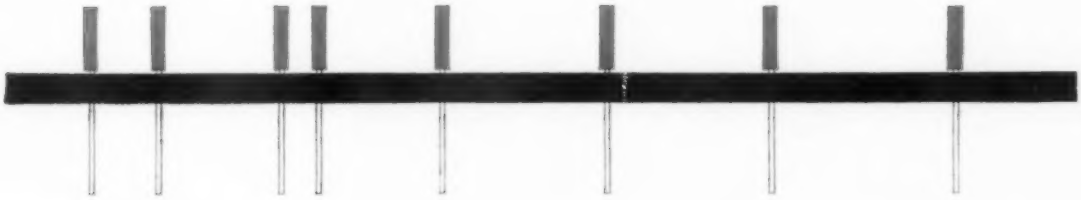
Irresponsible report on Suez

"The Senate antitrust and monopoly subcommittee investigated the Oil-for-Europe program last winter. Two weeks ago the staff of the subcommittee completed its report. The usual practice is for the staff to report privately to the committtee, which reviews the staff's observations. Then the committee decides what it will report on its own responsibility.

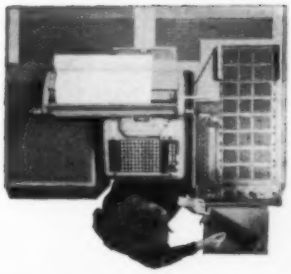
"But this was not done in this case. The staff presented its report at a public hearing. This staff report had not been formally approved by any member of the Senate. Its contents had not been discussed at a meeting of the subcommittee.

"The report has not a single good thing to say about the oil industry, though the subcommittee's record includes scores of hours of testimony by industry witnesses. We do not know whether the subcommitttee will endorse the findings of its staff, refuse to endorse them, or whether there will be

simple pinboard programming makes the difference...

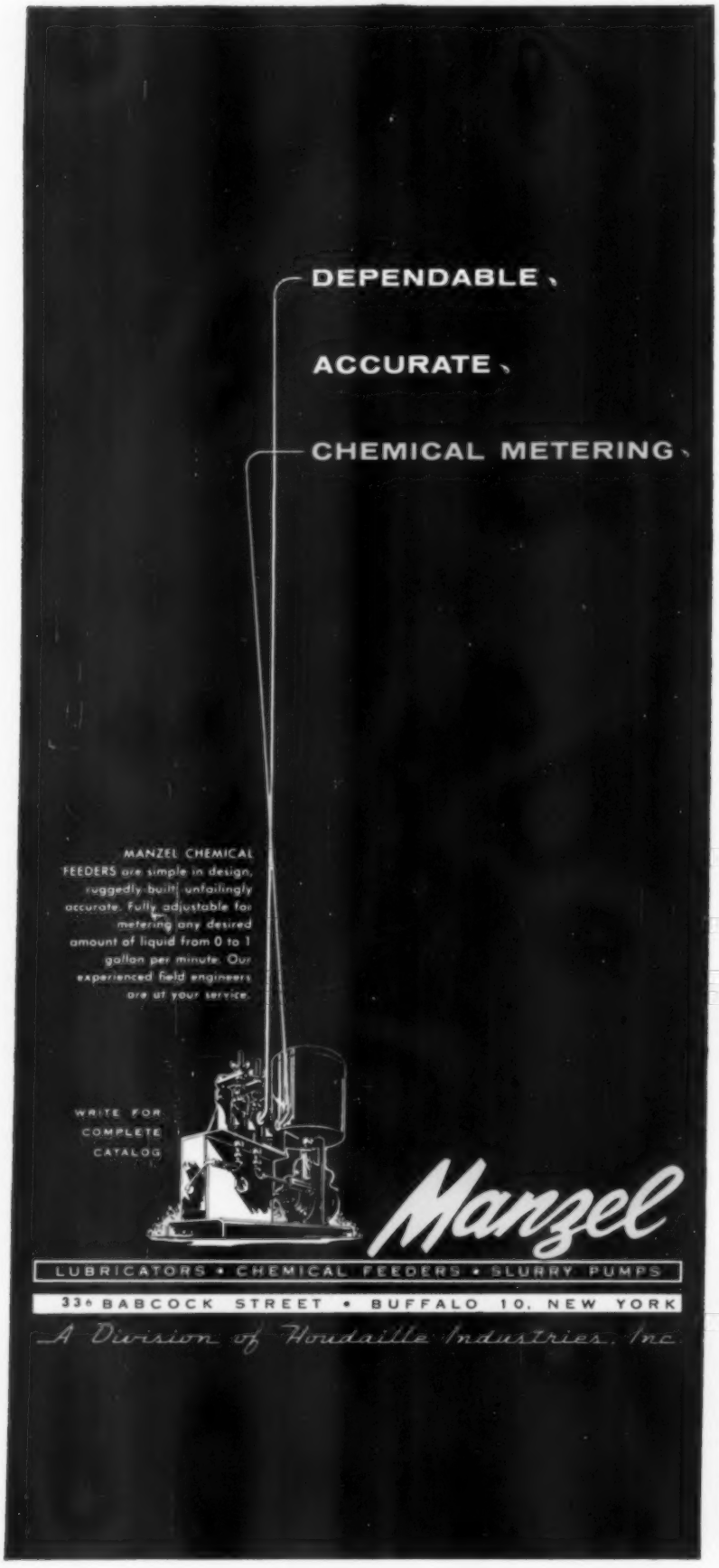


...a big reason why more E101's are at work than all other small electronic digital computers combined! Solves problems between the scope of desk calculators and costly "electronic brains"... at such low cost, and so handily, that priceless technical man-hours are saved. E101 digital computers can be delivered quickly... instantly available for low-cost technical computation. For proof, send us one of your problems or ask for a demonstration. For descriptive booklet, write:



ElectroData

Division of Burroughs Corporation
with world-wide sales and service facilities
460 Sierra Madre Villa, Pasadena, California


DEPENDABLE,
ACCURATE,
CHEMICAL METERING,
MANZEL CHEMICAL FEEDERS are simple in design, ruggedly built, unfailingly accurate. Fully adjustable for metering any desired amount of liquid from 0 to 1 gallon per minute. Our experienced field engineers are at your service.
WRITE FOR COMPLETE CATALOG
Manzel
LUBRICATORS • CHEMICAL FEEDERS • SLURRY PUMPS
33 BABCOCK STREET • BUFFALO 10, NEW YORK
A Division of Houdaille Industries, Inc.

disagreement in the committee with majority and minority reports.

"We do know that the staff's report has received much publicity abroad. And probably not one person in a thousand who read about it realized that it represents nothing more than the opinions of employes of a Senate subcommittee—people whose capabilities have never been scrutinized by the electorate."

Albert L. Nickerson, president, Socony Mobil Oil Co., Inc., in a speech to the Members' Council of the Commerce and Industry Association of New York, Inc.

Texaco looks at uranium

"Texaco was one of the first major petroleum companies to begin exploration for uranium ore in our western states . . . Behind this decision lie facts . . . sobering in the knowledge that the rate of increase in domestic oil reserves is not keeping pace with the rise in domestic consumption.

"All signs point to the fact that future energy requirements will be so great that nuclear power will be needed to supplement, rather than supplant, traditional fuels and power sources.

"Texaco is looking into the possibilities of uranium, while adding to its stature as a supplier of petroleum in order to pave the way for what promises to be a profitable future alliance."

"Texaco Looks at Uranium," article in the Texaco Star, magazine of The Texas Co.

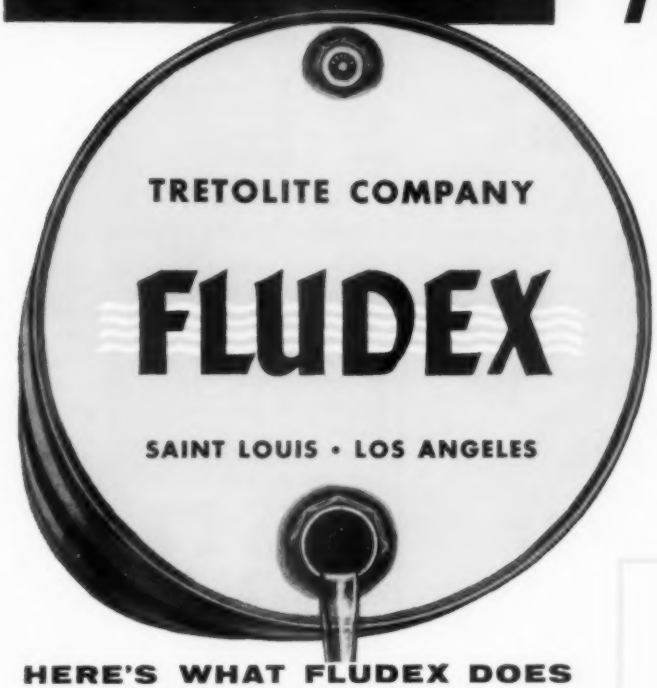
Our new type of inflation

"In wartime, governments do not collect enough taxes. So they resort to printing-press money or its modern equivalent of issuing debt to be, in effect, monetized through the commercial bank system. During the war . . . we had the old phenomenon of money increasing far faster than did the marketable production on which to spend it. The natural result was an upward inflationary pull on wages and prices despite wartime controls.

"Our new kind of inflation appears to be cost inflation pushing prices up, rather than price inflation pulling up costs through competitive bidding for materials and manpower.

"Wartime inflation is characteristic of American history. Continuous peacetime inflation is not . . . There are several features of this unique wage inflation worth attention . . . First is its frightening speed . . . Note secondly that wage inflation is surprisingly universal and uniform . . . Most disturbing feature of wage inflation is what appears to be its complete insensitivity to

NEW from TRETOLITE!



WATER FLOOD and WATER DISPOSAL STIMULATOR

enables formations to take more water... at lower pressures... in less time!

This new multipurpose chemical formulation is ideally suited for operation where combinations of scale, corrosion or bacteria are contributing to the malfunction of your flood or disposal systems.

HERE'S WHAT FLUDEX DOES ...AND HOW IT DOES IT

Makes Excellent WETTING AGENT.

FLUDEX conditions the surface of the formation so it will absorb more water more quickly at lower operating pressures.

Kills SULPHATE-REDUCING BACTERIA.

Destroys those bacteria which have the ability to reduce sulfates to hydrogen sulfide—which ultimately combines with soluble iron in the system to become insoluble, formation-plugging iron sulfide.

Inhibits CORROSION.

As a result of its bactericidal action, FLUDEX inhibits corrosion by reducing the production of corrosive hydrogen sulfide.

Aids in DEFLOCULATION OF SOLIDS.

By filming precipitates and suspended matter as soon as they are formed, FLUDEX eliminates the agglomeration of these objectionable deposits.

FLUDEX HAS BEEN FIELD-PROVED!

WRITE FOR YOUR COPY

of this new Booklet—describes the characteristics of FLUDEX, lists case histories, methods of application, etc.

TRETOLITE COMPANY

A DIVISION OF PETROLITE CORPORATION

369 Marshall Avenue, St. Louis 19, Missouri
5515 Telegraph Road, Los Angeles 22, California

Chemicals and Services for the Petroleum Industry

DESALTING • DEMULSIFYING • CORROSION INHIBITING • SCALE PREVENTION
FUEL OIL ADDITIVES • WATER DE-OILING • METAL DEACTIVATORS

T&F-57-8

A NEW IVERSON SUPPLY STORE

For the FOUR CORNERS AREA

111 N. Market **Phone 611**

Iverson Supply Company announces a new store to serve the four corners area of Colorado, New Mexico, Utah and Arizona.

The new store, located at Cortez, Colorado is completely equipped to serve customers round-the-clock, with both the speed and efficiency long known to Iverson Supply Store customers.

In rush periods, the Cortez store will be able to draw additional supplies from the nearby Iverson Supply Store in Farmington, New Mexico . . . a *plus service* available only from the Iverson Supply Company!

IVERSON SUPPLY STORES

OKLAHOMA — Oklahoma City, Okmulgee, Tulsa.
NEW MEXICO — Artesia, Farmington.
TEXAS — Kermit, Odessa, Snyder.
COLORADO — Cortez

IVERSON SUPPLY CO. OIL WELL SUPPLIES

OFFICES: FT. WORTH, DALLAS & MIDLAND, TEXAS

IVERSON SUPPLY COMPANY
DRILLING-PRODUCTION AND REFINERY EQUIPMENT
GENERAL OFFICES
P. O. BOX 1439 TULSA 1, OKLA.

OFFICES: DENVER, COLORADO TULSA, OKLAHOMA

economic forces as we learned about them in school.

"In war or peace, in boom or recession, under tightening money or easing money, whether unemployment be 3 per cent as recently or 17 per cent as in 1939—the wage inflation inexorably marches onward and upward. No economic event has halted it."

Robert C. Tyson, chairman of the finance committee, United States Steel Corp., in a speech at the annual National Industrial Conference Board dinner.

Sinclair favors imports

"Chase Manhattan Bank recently estimated that by 1966, our total domestic liquid hydrocarbon requirements will be in the order of 14,300,000 bbl. per day as compared to 8,757,000 bbl. per day in 1956, when domestic output supplied 90 per cent of domestic demand.

"To continue this pattern over the next decade and maintain present reserve capacity, the domestic industry would have to:

"Find 1-1½ bbl. for every 1 bbl. produced. The United States in 1956 found 1-1⅓ bbl. for every used 1 bbl.

"Meet cumulative demand of 38 billion barrels, against 24 billion barrels in the last 10 years.

"Add gross additions of reserves totaling 57 billion barrels against gross additions of only 37 billion in the last 10 years.

"Find 4½ billion barrels in 1957, against 3¾ billion in 1956.

"Drill 1.2 million wells over 10-year period ranging from 86,000 in 1957 to 165,000 in 1966. During the 10-year period ended in 1956 there were 463,605 wells drilled . . .

"With only an estimated 15 per cent of the free world proved reserves, the United States consumes 56 per cent of the free-world output . . . The industry and the Government owe it to the consuming public to continue a balanced program of imports without rigid restrictions."

P. C. Spencer, president, Sinclair Oil Corp., in a statement of company policies on imports.

CALENDAR

AUGUST

1-3 Rocky Mountain Mineral Law Foundation, third annual institute, Montana State University, Missoula, Mont.

19-20 North Dakota Oil and Gas Association, annual meeting, Bismarck, N. D.

26-28 Seventeenth annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

28-30 Instrument Society of America, International Symposium on gas chromatography, Kellogg Center, Michigan State University, East Lansing, Mich.

Organic Chemicals Division
MONSANTO CHEMICAL COMPANY
Dept. PAC-75,
800 N. 12th Blvd., St. Louis 1, Mo.

Please send me Monsanto's bulletin on Pydraul AC telling how to minimize (1) air compressor explosions and receiver fires (2) compressor maintenance due to deposits on exhaust valves and air system components.

*NAME*_____

*TITLE*_____

*FIRM*_____

*ADDRESS*_____

Want to reduce fire hazard in your air compressors?... Read Monsanto's bulletin on Pydraul AC

When flammable oil mists and films gather in your compressed air system . . . you have a real fire risk!

Ease your mind—there's a new, fire-resistant lubricant to protect your equipment, your workers and your production flow from compressor fires and explosions caused by flammable oils. Simply replace your ordinary petroleum oils with fire-resistant Pydraul AC compressor lubricant.

Pydraul AC is chemically made, not a water-soap base mixture, not a petroleum oil. It's a completely new type of bearing-protecting lubricant. Pydraul AC is created especially for air compressors. With Pydraul AC lubrication you ease your mind about compressor fires and explosions. You may also reduce maintenance costs because Pydraul AC can minimize carbon deposits on air compressor exhaust valves and air piping systems.

There's no conversion problem—just drain out the flammable lubricant and replace with fire-resistant Pydraul AC—it's that easy!

For more facts—fast: Just mail the coupon today for the new Monsanto bulletin on Pydraul AC. No cost to you. It shows properties, field experience, operating economies, etc. Act *now.* Mail coupon *today!*

There's also a fire-resistant Pydraul for every industrial hydraulic job:

- General-purpose Pydraul F-9
- Pydraul 150 and Pydraul 60 for precision equipment
- Pydraul 600 for heavy equipment

PYDRAUL: Reg. U. S. Pat. Off.

MONSANTO CHEMICAL COMPANY
Organic Chemicals Division
Dept. PAC-75, 800 N. 12th Blvd., St. Louis 1, Mo.

MONSANTO

Where Creative Chemistry Works Wonders For You

SEPTEMBER

3-5 Pacific Coast Gas Association convention, Fairmont and Mark Hopkins Hotels, San Francisco.

5-7 New Mexico Geological Society, eighth annual field conference, southwestern Colorado.

8-13 American Chemical Society, 132nd national meeting, New York City.

9-10 Independent Natural Gas Association of America, annual meeting, Shamrock Hilton Hotel, Houston.

9-11 American Institute of Electrical Engineers, petroleum industry conference, Sheraton Hotel, Philadelphia.

11-13 National Petroleum Association, fifty-fifth annual meeting, Traymore Hotel, Atlantic City, N. J.

19-21 Rocky Mountain Oil Show, fairgrounds, Casper, Wyo.

22-25 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Mayo Hotel, Tulsa.

23-25 American Society of Mechanical Engineers, fall meeting, Statler Hotel, Hartford, Conn.

26-27 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

26-27 Mid-Continent Oil and Gas Association, Louisiana - Arkansas division, Roosevelt Hotel, New Orleans.

30-Oct. 2 American Oil Chemists' Society, 1957 fall meeting, Netherland Plaza Hotel, Cincinnati.

OCTOBER

1-2 Texas Mid-Continent Oil and Gas Association, thirty-eighth annual meeting, Texas Hotel, Fort Worth.

2-4 Golden Trend Oil Show, Pauls Valley, Okla.

6-9 Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, fall meeting, Adolphus, Baker, and Statler Hilton Hotels, Dallas.

7-9 National Electronics Conference, thirteenth annual meeting, Hotel Sherman, Chicago.

7-9 American Gas Association, annual convention, Kiel Auditorium, St. Louis.

7-11 American Institute of Electrical Engineers, fall general meeting, Morrison Hotel, Chicago.

10-11 California Natural Gasoline Association, thirty-second annual fall meeting, Huntington-Sheraton Hotel, Pasadena.

10-12 American Society of Mechanical Engineers, American Institute of Mining, Metallurgical & Petroleum Engineers, fuels conference, Chateau Frontenac, Quebec.

13-15 American Association of Oilwell Drilling Contractors, seventeenth annual meeting, Mayo Hotel, Tulsa.

13-19 OIL PROGRESS WEEK.

17-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, Southern California petroleum section, fall meeting, Biltmore Hotel, Los Angeles.

17-19 Four Corners Geological Society, second field conference, Gallup, N. M.

18 American Institute of Chemical Engineers, South Texas section, twelfth annual technical meeting, Moody Convention Center, Galveston, Tex.

20-22 National Association of Oil Equipment Jobbers, annual convention and trade show, Hotel Peabody, Memphis.

24-25 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

25 Natural Gasoline Association of America, southern regional meeting, Washington - Youree and Captain Shreve Hotels, Shreveport.

27-29 Independent Petroleum Association of America, annual membership meeting, Statler Hilton Hotel, Dallas.

31-Nov. 1 American Association of Petroleum Geologists, Mid-Continent regional meeting, Cimarron Ballroom, Tulsa.

NOVEMBER

3-8 Society for Nondestructive Testing, second international conference, Hotel Morrison, Chicago.

6-8 Gulf Coast Association of Geological Societies, seventh annual convention, Roosevelt Hotel, New Orleans.

6-8 Society of Automotive Engineers, national fuels and lubricants meeting, Hotel Statler, Cleveland.

11-14 American Petroleum Institute, thirty-seventh annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

22 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

DECEMBER

1-3 Interstate Oil Compact Commission, annual meeting, Tulsa.

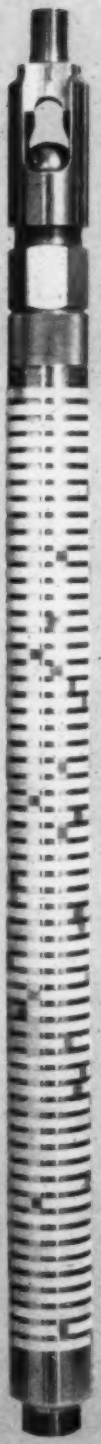
1-6 American Society of Mechanical Engineers, annual meeting, Statler Hotel, New York.

8-11 American Institute of Chemical Engineers, annual meeting, Conrad Hilton Hotel, Chicago.

PIPELINES are NOT SIDELINES with...
WILLIAMS BROTHERS
ENGINEERS & CONSTRUCTORS
NBT BLDG. • TULSA, OKLAHOMA
CABLE ADDRESS: WILLBROS.
New York • Washington • Louisville
Minneapolis • New Orleans
CANADA • BOLIVIA • COLOMBIA • VENEZUELA • TURKEY
OIL • GAS • WATER • PRODUCTS PIPELINES • PUMPING STATIONS

Metal to Metal Wear...

is the real villain in sucker rod pump troubles. It accounts for most of your repair and pump pulling expense.



The Martin Idea...

for getting away from this trouble has always been to make use of the best available materials — *Natural Rubber* for the key material in plunger rings; *Synthetic Rubber* for the key material in resilient ball guides for cages.

The accurately grooved and drilled metal body of **The Martin Plunger** does not touch the barrel. Only the resilient rubber and duck rings contact the barrel. This material — with its great natural resistance to abrasion as well as its slipperyness-when-wet — has a much slower wearing action on the barrel. Most often your barrel will not need replacing. These rings have an amazing ability to take the kind of abuse that goes with oil well pumping, and this means longer runs. Plunger cost is reduced because replacing the rings costs only about one fourth as much as a new plunger, and this saving is, of course, added to the barrel saving and longer runs.

Patent No. 2,591,174

The Martin Rubber Guide Cage protects the ball from all metal contact except when it rests upon its seat. The ball is protected to such an extent that ball and seat life is usually doubled. The synthetic ball guide and stop cannot beat out because of its resilience. Its life is therefore much greater than any metal and you get this longer cage life in addition to better ball and seat life. The two guides are easily replaced when the occasion does arise.

No real capital outlay is required to get these benefits because the cost of Martin Plungers and Martin Cages is very much the same as you are now spending for replacements — sometimes less.

All regular or stroke-thru ROD PUMPS and TUBING PUMPS can be equipped with Martin Plungers. Martin Rubber Guide Cages are made in all sizes and styles. Write for our catalog No. 4; also see Composite catalog for 1956-57.

JOHN N. MARTIN

Manufacturer

9 W. BRADY • TULSA, OKLA.

From blasting to backfilling...
quality pipeline construction requires
...the specialized personnel and equipment...
a comprehensive knowledge of techniques
...and a fund of experience built on
proved field performance...
H. C. Price Co....pacing the
pipeline construction industry for
more than a quarter century.

the price tower PIPELINE H·C·PRICE·CO CONSTRUCTORS bartlesville, oklahoma

The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 South Cheyenne Avenue, Tulsa, Okla. Phone Diamond 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

•

P. C. LAUINGER
President

S. H. ROURKE
Executive Vice President

MITCHELL TUCKER
Vice President and Advertising Manager

HANSON B. PIGMAN
Circulation Manager

DONALD W. WILSON
Manager Industry Census Department

J. PARKER HOLLAND
Production Manager

ADVERTISING OFFICES
TULSA
211 South Cheyenne, Diamond 3-6291
JOHN D. REILLY . . . Mid-Continent Manager
ROY E. FINLEY . . . . . Representative
D. B. MILLER . . . . . Classified Adv. Mgr.

NEW YORK
500 Fifth Avenue, LOngacre 4-6160
E. S. KLAPPENBACH . . . . Eastern Manager
HARRY B. BULLEN . . . . . Representative

PHILADELPHIA
1509 Land Title Building
Broad and Chestnut Streets,
RIttenhouse 6-0118
JOHN W. MEANY, JR. . . District Manager

CHICAGO
105 West Madison Street, CEntral 6-2537
DAVID T. KENNEY . . . . . District Manager
KAREL WEGKAMP . . . . . District Manager

DETROIT
204 Washington Square Building,
Royal Oak, Mich., LIncoln 7-9455
JOHN D. YODER . . . . . District Manager

PITTSBURGH
106 Nelson Avenue, FRemont 1-7775
ALFRED M. JONES . . . . . Manager

HOUSTON
802 Sterling Building, CApital 4-7726
JOHN M. SPEARS . . . . Gulf Coast Manager

DALLAS
1238 Mercantile Bank Building,
Riverside 8-3074
PREN G. HOLLINGSWORTH . Representative

LOS ANGELES
650 South Grand Avenue, VAndike 0722
GEORGE O. RUPPERT . . . . . District Manager

ENGLAND
National Provincial Bank Chambers,
15 Grafton Street, Altrincham
Phone Altrincham 3160
HARRY BECKER . . European Representative

•

Subscription rates to the petroleum industry, United States and foreign, 1 year, $4.00; 2 years, $7.00; 3 years, $8.00. Single copies: regular issues 50 cents; special issues $1.00. Back copies when over a year old, $1.00. Note: Payments from outside the U.S.A. may be made by international money order, New York exchange, or check on a U.S.A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879. Copyright 1957 by The Petroleum Publishing Co.

Member
Audit Bureau of Circulations
Associated Business Papers

JOURNALLY SPEAKING

Oasis Psychology

THE OIL INDUSTRY prides itself on having made great contributions to the advance of civilization.

But has it really? Are its contributions purely of the material sort—simply providing fuel and power which mankind uses in a multitude of frantic activities that the unthinking consider to be progress and advancement? Has the industry failed to stimulate the aesthetic, moral, philosophical, spiritual, and ethical aspects of civilization in the broad sense of that term?

There is reason to doubt it. And the reason would seem to be that the industry has discovered and developed its oil in the wrong places.

This doubt springs from reading an article by a professor of history. The article isn't about oil. But it does deal with the area where the oil industry seems to prefer to produce its oil—the desert and the arid semidesert.

This professor has little use for what he says always should have been called the Great American Desert, meaning the 17 states lying west of the Missouri River and the Ozark Mountains. This area, of course, is where the bulk of the country's oil is produced and where a majority of oil men live and exert their influence for the advancement of civilization, if any.

It was a great mistake, this historian believes, to strike the Great American Desert from the maps about the time of the Civil War. He observes dryly that the name now is "hardly ever mentioned in polite western society, and never by the Chambers of Commerce."

Nevertheless, he insists, the Great American Desert is a fact and its existence can't de denied by pointing to the few scattered oases, such as Denver and Los Angeles, where man has been able to find or import enough water to sustain life and build a plausible resemblance to a civilized community.

Apparently every oil town west of the Mississippi would be classed by the professor as an oasis—and oil is largely responsible for the existence of many of the other oases. The existence of these specks of "oasis civilization in a sea of aridity," in the professor's view, may have concealed but has not altered the fact that it is still the Great American Desert and always will be, and as such it isn't worth a hoot in the advancement of civilization.

No great men, no great ideas, no great cultural movements have come out of this desert, he says, and he thinks none ever will because of his theory that such really civilizing things develop in direct proportion to the local annual rainfall. Instead, he implies, the West is kidding itself with an "oasis psychology" which tries to conceal its essential poverty by blowing up and bragging about what few meager assets and traditions it can claim.

How about that? Is the oil industry a victim of, as well as largely responsible for, this "oasis psychology"? Is it living in and fostering this fool's paradise of self-delusion that a city (or an industry or an individual) is civilized just because it has managed to surround itself with the outward physical stage props of civilization?

Understand, we're not espousing this professor's thesis. We're just passing it on as a reportorial service. (As a matter of fact we can offer personal refutation of the theory because we live in one of these oil-built oases in the Great American Desert and we generate a Great Idea every week. But apparently the professor doesn't read this column.)

However, this article should give oil men pause for thought—if any of them who inhabit the Great American Desert are sufficiently civilized to entertain profound philosophical thoughts.

Maybe the industry would do better to abandon its oasis psychology and quit looking for oil in the desert and building up the fruitless West.

Perhaps it should transfer its exploration activities to the civilized East, where the levels of precipitation and culture are higher. Then it might make more genuine contributions to the advance of civilization. Or at least the Easterners might give it more credit for those it has made.

—*Henry D. Ralph.*

DON'T STAY IN THE DARK...

TO WARREN *for:* **QUALITY QUANTITY SERVICE**

Whatever the GRADE and the VOLUME of

NATURAL GASOLINE

Just rely on WARREN'S versatile facilities to give you dependable deliveries . . . WHERE and WHEN and the WAY *you* want them.

WARREN

PETROLEUM CORPORATION

TULSA, OKLAHOMA • Cable Addresses: STAVOLENE, WARREN

EXPORT TERMINALS: CORPUS CHRISTI, PORT ARTHUR, BAYTOWN, TEXAS CITY AND WARRENGAS, HOUSTON, TEXAS, SAN PEDRO, CALIF.

Of Audrey and oil men

THE news accounts of the disaster wrought by Hurricane Audrey on the Louisiana coast carried occasional references to relief and rescue work by oil-company crews.

Actually their contributions were enormous. The suffering, and doubtless the death toll, would have been far higher without them. Some companies estimate that the oil industry's money loss in assisting in civilian relief was considerably greater than physical damage to oil equipment and installations.

Oil operators large and small, together with oil service and supply companies, went all out to assist the stricken communities and people in every possible way. The task, and the expense, of private and governmental relief agencies was tremendously lightened as a result.

ANY INDUSTRY would have done the same, of course. But the oil industry was peculiarly equipped for such an emergency. It not only had equipment of great variety and versatility, but it was organized for on-the-spot decisions and experienced in emergency action.

It had boats of every description from outboards to drilling tenders which it used in rescue work. It had cars, trucks, bulldozers, and cranes. It had company doctors, nurses, dispensaries, first-aid supplies, and emergency rations on hand.

Its own weather-warning service supplemented that of the Government. Its varied radio communications systems were thrown into use when the regular services broke down. It got gasoline to rescue crews and water to survivors.

Most of all it had men, men who knew what to do in emergencies. It had engineers to clear away wreckage, to improvise water supplies, to keep electricity on at hospitals and relief stations. It had men of stamina and skill who willingly worked around the clock to help the unfortunate victims of the hurricane's fury.

All employes who volunteered for rescue and relief work were cheerfully given time off from company duties. And the companies and their employes as individuals made heavy contributions of money and goods to the relief organizations.

WHAT OIL PEOPLE did in the wake of Audrey, and what they traditionally do in similar crises elsewhere, is no more than any good citizen would do in like circumstances. The oil industry wants no special credit for it.

But sometimes oil men wish that the industry's critics would remember such things and would temper their tongues when tempted to replay the standard diatribes about oil being composed of soulless corporations and money-grabbing monopolists contemptuous of human welfare and public weal.

The folks down in South Louisiana think oil men are pretty fine neighbors.

Good Wells Make Good News

July 15, 1957

FRACTURING TREATMENTS often give better results when acid is used as part of the treatment. Here are four recent examples showing different ways Dowell has used acid to improve fracturing results.

- **Coleman County, North Texas** (Old Well): Production has declined to 3 bopd from well completed in Capps lime through perforations at 1907 to 1935 feet. Earlier treatments had been unsatisfactory. Dowell fractured with Riverfrac* using 20,000 gallons of water containing three per cent acid, F.L.A.* (Fluid Loss Additive), a de-emulsifying agent and 20,000 pounds sand. Injection down casing at 25 bpm. *Well stabilized at 20 bopd after treatment. As a result of success with this treatment, drilling was resumed in field.*

- **Caddo Parish, Louisiana** (New Well): Drilled into highly soluble Fredericksburg lime, 2374 to 2378 feet, in field where most wells are strippers. 1000-gallons Dowell acid spearhead was followed by Acid Petrofrac® using 10,000 gallons acid-in-oil emulsion and 20,000 pounds sand. Injected at 1800 psi and 25 bpm down casing. *After five days, well had produced 1000 barrels oil and was flowing through choke at 75 bopd.*

- **Matagorda County, South Texas** (New Well): Completed in Frio sandstone through perforations 8902 to 8924. Before fracturing, drill stem tested 680 psi on ¼-inch choke. Dowell provided Stratafrac®, using 12,000 gallons acid-kerosene emulsion with 30,000 pounds 60-80 mesh sand. Injection down 2-inch tubing at 6000 psi, 2½ to 5 bpm. Following treatment, well tested 1750 psi on ¼-inch choke and is now *producing 2000 mcf gas and 82 barrels distillate per day.*

- **Fort St. John, British Columbia, Canada** (New Gas Well): Drilled into Triassic "D" sand with perforations 4691 to 4709 feet. Well tested 18,000 mcfpd open flow. Dowell performed fracture treatment using 500 gallons Mud Acid followed by Petrofrac® using 20,000 gallons emulsified diesel oil with 20,000 pounds sand. Pumped down 2½-inch tubing through packer 4600 psi at 7 bpm. *Following quick clean-up, well tested 137,000 mcfpd open flow.*

These are just samples of the wide range of fracturing treatments provided by Dowell for good results in any formation. For more information or service, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma.

Services for the oil industry

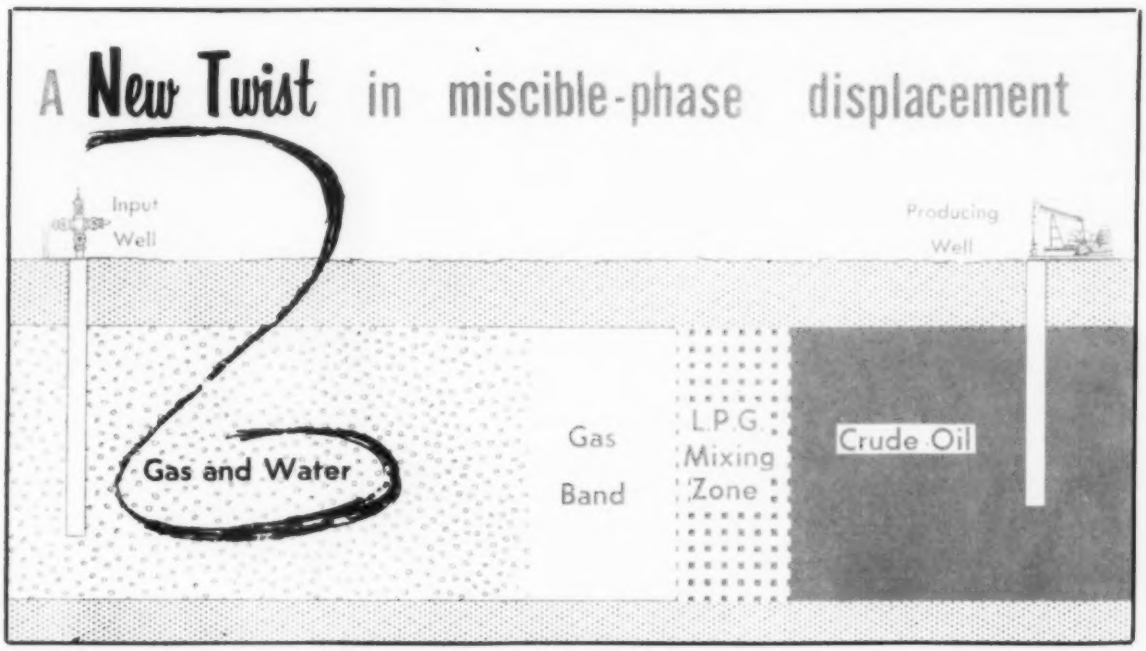
DOWELL

A Service Subsidiary of The Dow Chemical Company

*Trademark of Dowell Incorporated

The OIL AND GAS JOURNAL

July 15, 1957



Gas, water slugs to follow propane, gas in . . .

Atlantic's New Oil-Recovery Idea

A MISCIBLE-PHASE displacement plan with a unique twist may soon get its chance in the field.

If the plan works as well as the operator expects, it will recover essentially all the crude oil in the reservoir rock—much more than could be produced in any other known way.

The operator with the idea is Atlantic Refining Co. Atlantic engineers, who have spoken at several industry meetings on the subject, are armed with the results of months of intensive lab research. And the company is sold on the results—sufficiently so to plan a full-scale operation in a West Texas field without a precautionary pilot test first. Only an adverse decision by the Texas Railroad Commission might block the plan, and this is not very likely.

Here's what Atlantic proposes to do:

. . . **Inject a propane slug.**

. . . **Follow this with gas.** The gas band would not exceed 20 per cent of the reservoir volume.

. . . **Inject gas and water** simultaneously, following the gas band. This would more than likely be done by slugging first one then the other through the same inputs.

Why water? . . . Why is Atlantic going such a tedious route when it is generally agreed in the industry that a miscible drive—the propane slug alone—will sweep 100 per cent of the oil from the rock wherever it reaches?

The answer: Atlantic and several other operators think such a drive won't "reach far enough."

The company has found that a miscible drive alone couldn't be economically justified when stacked up against a water flood in any of the numerous fields where Atlantic considered the two methods as competitors.

Any miscible drive has this major drawback: A poor mobility ratio. This means that, though it will sweep clean wherever it reaches, it won't touch a considerable part of the total reservoir rock.

Some other firms disagree on this point, but Atlantic says studies show that a miscible drive will sweep even less of a reservoir than gas alone, and much less than water.

The company has compiled these rough averages from studies of the displacing efficiencies of the various fluids in a large number of fields with hypothetical injection on a five-spot pattern:

. . . **A gas drive** will sweep an average 90 per cent of the reservoir. But it will recover only 45 per cent of the oil from that area for a total take of 40 per cent of oil in place.

. . . **A water flood** will sweep practically the entire reservoir—about 98 per cent—but will net only about 67 per cent of the oil in that space. This figures out to total recovery of about 65 per cent of oil in place.

. . . **The miscible drive,** Atlantic estimates, will hit only a surprisingly

low 65 per cent of the reservoir rock but will recover 100 per cent of the oil in that space. Thus, total recovery would figure out about the same as the water flood (about 65 per cent of oil in place).

Since the miscible drive ordinarily is more expensive than a flood, the latter would have to be selected.

Gas and water . . . The key to realizing the potential of the miscible drive, Atlantic concludes, is to improve the drive's mobility ratio. By some means make it cover more territory.

Atlantic is certain the answer is propane, chased by gas, followed by gas and water injected simultaneously.

By so doing, Atlantic counts on improving the drive's reservoir coverage in two ways:

1. The injected water will lower the pay zone's relative permeability to gas by interfering with the gas flow.

2. The water also will increase the average viscosity of the flowing system pushing the oil.

Taken together, these effects will greatly improve the drive's mobility ratio. Atlantic thinks sweeping essentially the entire reservoir. The end results should be recovery of very nearly 100 per cent of all crude.

Careful planning . . . Such a drive, of course, would have to be planned very carefully. The whole miscible scheme, for instance, would be upset if the water should catch up with the propane. And if the band of gas were too wide between the propane on one side and the water and gas on the other, much of the benefit of this type of program would be lost.

But the beauty of the idea, Atlantic says, is that it is foolproof. Suppose water should break through to the propane? Then you would have a water flood. If this should happen through some miscalculation, it likely wouldn't be early in the program. But no matter when it happened, the operator still would get all the oil he could have produced via a conventional water flood plus the added oil he had obtained due to the miscible drive while it lasted.

Other operators, whether they agree with Atlantic's findings on miscible-drive mobility ratios or not, are going to watch this project closely.

The company is a veteran in the miscible-displacement field, being the first actually to launch a full-scale program with its high-pressure gas-injection operation in Block 31 Devonian field of Crane County, West Texas. It has amassed a batch of experience since it kicked off the Block 31 project in July 1949. And its experience is respected.

It's one down, two to go:

Gas Bill Is on Its Way

WASHINGTON.—The Harris bill to free natural-gas producers from federal control passed its first test in Congress last week, unmarred by efforts to water it down.

By an expected slim margin of two votes, the House commerce committee approved the measure and sent it on its way toward the House floor.

The actual vote was 15 to 13. But Chairman Oren Harris of Arkansas said that two members present did not vote because they don't favor even as little regulation as the bill provides. And two of three absent members would have supported the bill, Harris said.

The margin in favor of the bill, both actual and potential, was greater than it received in 1955, when it was sent to the floor by a vote of 16 to 15, Harris pointed out.

Final committee action followed a vote of 19 to 11 to reject a substitute bill offered by Rep. Torbert H. Macdonald of Massachusetts. His bill would have exempted only producers with an annual output of 2 billion cubic feet or less.

A "full and complete explanation of the bill" is now being written by the majority. The minority also will write its views, Harris said. When the reports are complete, the House rules committee will be asked to hold a hearing on a committee request to send the bill to the floor quickly.

Harris' reaction . . . Harris was obviously pleased with the result of the committee vote. But he refused to predict what the future course of the bill might be.

"I have been taking this a step at a time," Harris said. "I have made no predictions or comments from the outset."

Harris, however, did intimate that if the bill reaches the White House it will be signed by the President. He has been "reliably informed," he said, that the administration likes the measure as now written.

House leaders also took a cautious view of what may happen to the bill. The best that Speaker Sam Rayburn of Texas would say was that he hopes it can be taken up this session.

Next steps . . . The fight in the commerce committee was only the first of three the bill must win on the House side of the Capitol.

Its next stopping place will be the rules committee, the most powerful

OREN HARRIS
. . . pleased and "reliably informed."

group in the House. This committee decides whether a bill shall go to the floor for quick action and fixes the time allowed for debate. If a rule is denied, the bill goes on the House calendar and can be called up by the committee in charge of it in due course. But rejection by the rules committee usually is fatal to a measure.

Not all the members of the rules committee favor the Harris bill. Harris himself said he did not know how the committee would receive it. It may find the going rough. Nevertheless, it is expected to be sent along to the House.

The House floor will offer the toughest test of all. It was here that the original Harris bill squeaked through by a margin of only six votes in July 1955. Forecasts of the result this year range from a flat assertion by Macdonald that it will be defeated by 50 votes to hopeful belief of supporters that it will get through again with a margin of a half-dozen or so votes. But nobody claims the measure will pass the House by a smashing majority.

Finally, if the bill weathers the storm and passes the House it will come up against a stop sign at the Senate door. The Senate has no intention of taking it up this session.

All this means that gas producers will still have to live with the present federal controls until next spring, at least.

Two changes approved . . . The measure approved by the commerce committee is a "clean" bill which Harris and Rep. Joseph P. O'Hara of Minnesota separately had put in the House a few days earlier. It is a partial rewrite of the original identical measures they sponsored last April 10.

Aside from a number of technical changes which have no effect on its provisions, only two additions were made to the bill.

One of these provides that the "taxing or conservation powers of any state or local authority" shall not be impaired by the Natural Gas Act.

This amendment was considered important in view of another clause in the same section barring the states from fixing the price of gas "either at or before the commencement" of interstate transportation.

The other change strikes out a provision of the present law denying the Federal Power Commission authority "to suspend the rate, charge, classification, or service for the sale of natural gas for resale for industrial use only."

This is designed to give industrial customers the same rights as other consumers in such matters as refunds when rate increases in effect under suspension are later denied or reduced.

In all other important respects the bill is the same as the original measure (OGJ, April 15, page 81). To keep it that way, the committee voted down a large number of demands for changes.

Amendments rejected . . . Included in the rejected amendments were the two proposed by the administration. These would have allowed the FPC to consider cost in passing on producer prices and to reopen existing contracts for price review. They were, in effect, killed by President Eisenhower himself when he said he did not consider them essential in a bill meeting his approval.

The committee also rejected proposals that only the smaller producers be freed from controls and the 60-odd largest companies be kept under regulation. An amendment requiring pipelines to expand into new areas where need existed and another imposing end-use controls likewise were voted down.

Some of these may be revived on the House floor. But it is doubtful that any will be adopted, although some votes might be attracted among coal-state congressmen if the FPC were given control of industrial and "dumping" sales by pipelines.

Action On Imports Near

Cabinet committee expects to put a voluntary plan into effect this month—but it'll have built-in pressure

WASHINGTON.—The cabinet imports committee expects to clear final hurdles this week to putting a control program into effect before the end of July.

The committee held its first full-dress session last week behind closed doors. There was no official comment on how discussions were progressing.

But this much is known: Committee members and their aides have completed a large amount of detailed work on the problem. They expect to iron out the final plan quickly within a few days.

The final plan, it is understood, will be a compromise between stiff government controls and a voluntary effort by the industry.

Here's how it will work: The entire plan will be based on 1956 import figures. Cuts will be clear, arbitrary, and across-the-board. Acceptance by importers will be voluntary. But every move under the program will be given wide publicity. This pressure plus the veiled threat of stiff government controls if the plan fails is expected to have a persuasive effect.

Insiders point out if the plan doesn't work, the world will know who the recalcitrants are. The onus will be on them for its failure. Then, they explain, there will be plenty of time to put teeth into another plan. These sources say the administration is convinced the President has the legal powers to enforce any import restriction.

Appeals haven't worked . . . The administration prefers to take a new approach to the voluntary plan first before undertaking any sterner action. These officials admit little success in previous efforts to get voluntary cutbacks in import schedules.

Some 25 of the major importers were given a last chance by Mobilization Director Gordon Gray to revise their schedules. The unsatisfactory replies are understood to have been reported to the cabinet committee headed by Commerce Secretary Sinclair Weeks.

Under the new voluntary approach, officials privately admit that the long-term importers will have to cut back enough to make room for the newcomers. But they added the newcomers will not be completely satisfied with their "allowables."

The latest volunteer-under-pressure plan represents another change in thinking among cabinet members and their assistants. Only last week this group leaned toward full government control.

The administration reasoned then that so many companies—both small and large—were now engaged in foreign operations that it would be nearly impossible to make a voluntary plan work.

But they were still reluctant to put the Government squarely into the oil-regulating business. They preferred to use a little more pressure toward a voluntary plan, knowing they always could quickly impose some sort of quota plan.

One definite decision has emerged from conferences so far. The idea of using tariffs to control imports has been abandoned.

It won't work and is out of the question, one official declared. Under constitutional law, the Government can't impose a discriminatory tariff, he explained. Officials have agreed it is impossible under our present trade agreements to devise an oil tariff which wouldn't be discriminatory.

Some opposition . . . Marketing interests, meanwhile, have launched a full-fledged campaign against any restrictions on foreign oil.

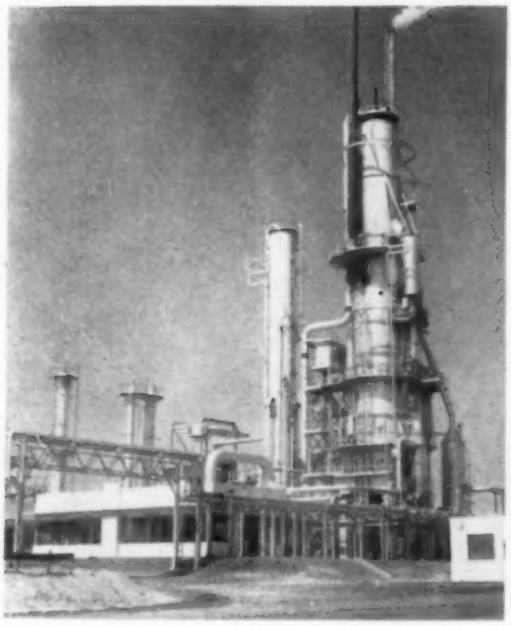
But in Congress, oil-state members are pressing equally hard for quick and enforced limitations.

The jobbers' viewpoint was laid before President Eisenhower in a letter by Otis Ellis, counsel for the National Oil Jobbers Council. Any move to limit crude imports, Ellis warned, would bring higher prices for oil products and add to inflation.

Ellis called for an open hearing before the cabinet committee. Only there, he said, could all of the facts "be aired and subjected to scrutiny in order that Congress as well as the man in the street may know exactly what the situation is."

The cabinet group, meanwhile, is conducting its studies against a backdrop of increasing imports.

The flow of foreign oil is expected to hit a record high this month of 1,216,200 bbl. daily. The Texas Railroad Commission estimates imports may ease off in August to 1,201,700 bbl. daily. Estimates for September are 1,166,200 bbl. daily and for October 1,127,900 bbl. daily (OGJ, July 1, p. 82).



Tyler refinery (left) and Falfurrias field-processing plant give . . .

New Look to Texas Eastern Pipeline

● **Stock swap for La Gloria holdings strengthens big gas-transmission firm in both oil-gas production, processing**

SHREVEPORT, La.—Texas Eastern Transmission Corp. is expanding into oil and gas production and refining through acquisition of La Gloria Oil & Gas Co., Corpus Christi.

Directors of Texas Eastern have voted to offer La Gloria stockholders one share of Texas Eastern for each of the million shares of La Gloria capital stock outstanding.

La Gloria directors have approved the share-for-share offer. It hinges on acceptance by holders of 81 per cent of La Gloria shares. However, La Gloria has only 150 stockholders with officers and key personnel holding more than 50 per cent of the stock.

Texas Eastern common was quoted at 26½ bid, 27¾ asked in over-the-counter market early last week.

What it means . . . Texas Eastern President Orville S. Carpenter said the deal involves about $70 million considering the market value of Texas Eastern stock and other factors.

"Acquisition of La Gloria, a leading producer of oil and gas, will fit in perfectly with Texas Eastern's planned expansion and diversification program," Carpenter said.

"La Gloria, long a supplier of natural gas to Texas Eastern, is a well managed, successful company," Texas Eastern Chairman George R. Brown explained. "In addition to its many millions of assets, it will bring into the Texas Eastern organization an extremely capable management-employe group with an outstanding record of achievement."

Brown said if the arrangements are completed La Gloria will be operated with its present management and personnel as a subsidiary of Texas Eastern.

John F. Lynch, president of La Gloria, announced he believed that employes and stockholders of La Gloria would benefit immeasurably from becoming a part of the Texas Eastern organization.

What's involved . . . La Gloria will bring into the Texas Eastern organization a unit strong in oil and gas production, field processing and refining.

La Gloria at the end of 1956 had interest in 526 producing wells. Its oil production totaled about 7,000 bbl. daily. Gas output was 80,000 M.c.f. daily. It owns and operates a modern field-processing and cycling plant at Falfurrias, Tex. Total output of natural gasoline, kerosine, and L.P.G. is 8,500 bbl. daily with prospects of reaching 10,500 bbl. daily by the end of the year.

In addition, La Gloria owns the McMurrey refinery at Tyler, Tex. It acquired this 25,000-bbl. daily plant earlier this year in a move toward integration. The McMurrey purchase also included 25 miles of main crude line and gathering systems in East Texas (OGJ, Mar. 11, p. 110).

The McMurrey plant, recognized for its modern refining methods, makes premium motor fuels, avgas, kerosine, diesel fuel, petroleum coke, and certain specialty products.

The La Gloria properties also have the added advantage of fitting neatly into Texas Eastern operations. The Falfurrias processing plant is near a new pipeline Texas Eastern is building from Beaumont to the Texas-Mexican border. The McMurrey refinery easily can be tied into the Little Big Inch line which Texas Eastern is converting from gas to products. Texas Eastern already has a triangle feeder system to Carthage in East Texas near the refinery.

Texas Eastern's own oil and gas production is very nominal. The company's production division last year reported gas output of 31,171 M.c.f. daily and crude production of 1,349 bbl. daily. The company has no refining facilities.

Look for new fields . . . The Texas

Eastern-La Gloria deal follows a pattern pretty well set in the past few years by management of natural-gas transmission companies.

The transmission lines are closely regulated by the Federal Power Commission. Their profits are limited to 6 per cent. Management, as a result, has steadily looked at other fields where profits are not limited into which the companies can move.

One official remarked recently his company was considering several such deals with one aim: Larger profit so stockholders can get a more favorable return.

El Paso Natural Gas Co. is a prime example of the trend. In a 2-year span this giant pipeline concern with drilling and producing activities has spread into refining, marketing, and petrochemicals (OGJ, Sept. 3, 1956, p. 72). It stepped up this growth by merging with Pacific Northwest Pipeline Corp. (OGJ, Jan. 21, p. 58).

Southern Natural Gas Co. only last May revealed plans to step into refining by purchasing Suntide Refining Co.'s 65,000-bbl. plant at Corpus Christi. Southern Natural expects to complete the $50 million stock purchase deal by early 1958 (OGJ, May 13, p. 84).

Other big natural-gas transmission firms, such as Tennessee Gas and Panhandle Eastern, earlier had entered petrochemicals and processing as joint ventures with other corporations.

Burning Gas Well Dies

FORT ST. JOHN, B.C.—Flames which raged out of control for 6 days at a natural-gas discovery 80 miles south of here died early last week after taking the life of an engineer and hospitalizing two members of the drilling crew.

Dead was W. E. (Bill) Walton, Jr., 30, of Ardmore, Okla. Walton was district production foreman for Sinclair Oil Co. of Canada, the operating company. Earl Miller and Sandy Reise, both of Fort St. John, suffered third-degree burns. They are with Dominion Drilling Co., Ltd., of Edmonton.

Some reports tabbed the well as a major discovery. Sinclair officials in Tulsa, however, said results of a drill-stem test taken at 6,214-40 ft. had not been evaluated.

Location of the well is 350 miles northwest of Edmonton and 30 miles off the Alaska Highway at Mile 95. The blowout and fire occurred July 3 from gas seeping up from about the 6,000-ft. level as core was being pulled. The well died July 9.

Toronto Refineries Cleared

TORONTO. — Cities Service Oil Co. and Shell Oil Co. of Canada, Ltd., have received final approval to locate their two 20,000-bbl. refineries in the Toronto area.

The Ontario Municipal Board, which is the final authority on zoning in the province, last week approved their rezoning applications. Now the way is clear for both companies to build in suburban Bronte along the Lake Ontario shore southwest of Toronto. Residents of the area had opposed the projects.

Cities Service has let contract for its refinery to C. F. Braun & Co. Actual construction is now due to begin late this month or in early August. Completion, originally scheduled for the fourth quarter of 1958, is now estimated for December.

Shell does not plan to build immediately. Plans for the various process units have not yet been firmed up. The Shell refinery will probably be started in 1958, for completion in 1960. Both refineries will process Canadian crude.

Capacities . . . The Cities Service refinery will have a crude-charge capacity of 18,800 bbl. per calendar day and 20,000 bbl. per stream day.

Capacity of other units planned—in barrels per calendar day—will be 7,600 for the vacuum stage of the crude unit; 13,300 for the U.O.P. fluid catalytic cracking unit; and 3,110 total feed capacity for the Sinclair-Baker type catalytic reformer.

The cat cracker will charge 6,300 bbl. daily of fresh feed and 7,000 bbl. daily will be recycle. The cat reformer will produce 97 clean R.O.N. reformate. Splitter facilities will be installed for both cat cracked and reformed product. The light-ends recovery unit will include a butane splitter to concentrate butylenes.

Total storage at the refinery for crude and product will run 1,662,000 bbl. Of 29 tanks planned, 21 will have floating roofs. Product will be shipped about 70 per cent by truck and 30 per cent by rail. The plant site will not include a dock.

A cooling tower will be built to avoid once-through cooling water circulation and to reduce pollution.

Pay First, Help Yourself: It looks like a cross between a pay telephone and a service-station pump, but it gets the job done. The motorist can deposit quarters, half-dollars, or silver dollars in the slots of the attachment at left, then serve himself as the man above is doing. The new device was installed recently at this Andy Dandy Oil Co. station at Farmington, N. M. The coin-receiver mechanism is made by Automatic Device Co., of Fort Collins, Colo. The car being filled belongs to R. B. Ward. Journal staff photographer, who was on a trip to the San Juan basin and the Four Corners area.

The Rise In White-Collar Jobs

	Total employment	White-collar workers	Production workers
Petroleum refining—			
1947	189,300	47,800	141,500
1956	201,800	70,100	131,700
Increase or decrease	12,500	22,300	—9,800
Per cent increase or decrease	6.6	46.7	—6.9
Crude-oil production—			
1947	*237,300	*117,300	120,000
1956	*320,900	*190,000	130,900
Increase	83,600	72,700	10,900
Per cent increase	35.2	62.0	9.1
Chemical and allied products—			
1947	694,000	169,000	525,000
1956	834,500	279,300	555,200
Increase	140,500	110,300	30,020
Per cent increase	20.2	65.3	5.8
All manufacturing—			
1957	15,247,000	2,453,000	12,794,000
1956	16,893,000	3,719,000	13,174,000
Increase	1,646,000	1,266,000	380,000
Per cent increase	10.8	51.6	3.0

*Drilling and rig-building included, but excluded in production workers' figures.

Bargaining power's at stake:

White Collars Worry O.C.A.W.

DENVER.—Organized labor is alarmed over the increasing number of white-collar employes in the oil and chemical industries.

With automation making giant strides in refining and producing, the industry is hiring fewer and fewer workers, and adding more and more white-collar people to the payroll.

This trend can only result in a general weakening of organized labor's bargaining strength, the Oil, Chemical, and Atomic Workers International Union told its 105,000 members last week.

Since 1947, the number of crude-oil production and refinery workers has increased less than 1 per cent, while the number of white-collar employes has increased more than 57 per cent.

It's more difficult to organize white-collar job-holders, and this threatens the possibility of effective strike action, O.C.A.W said.

"The minute (refinery) production workers walk out of the plant, the nonproduction (white-collar) employes —particularly technicians and engineers—can be mobilized to take over the operations of the plant. The expanding automated processes tend to make this even more feasible."

The union charged that many companies are replacing workers with technicians and engineers, "primarily to eliminate these jobs from bargaining units."

O.C.A.W. said Labor Department figures show that three out of four employes in the refining and chemical industries in 1947 were production workers. By 1956, this ratio had dropped to two out of three.

The union reports there are:

. . . 9,800 fewer refinery production workers in 1956 than in 1947. This is a drop of nearly 7 per cent (see table). On the other hand, white-collar employment gained nearly 47 per cent.

. . . Only 10,900 more production workers in the crude-oil producing branch as compared with a whopping 72,700 additional white-collar employes.

Other industries show the same general trend, but to a slightly lesser degree than in the oil industry, where automation has made big headway in the past few years.

O.C.A.W. reminded its members that white-collar workers are difficult to organize; therefore, there is the "rather ominous prospect that a great number of our working force is likely to be in unorganized groups."

O.C.A.W. carries a big stick in company wage and fringe-benefit policies. This year, for example, the union demanded a fat 27-cent wage increase, settled for a healthy 18-cent "package" deal.

Industry briefs

Douglas Oil Co. of California last week was closing out its purchase of two-thirds of the common stock of Apex Petroleum Corp., Ltd., of Long Beach, Calif., in a deal which more than doubles Douglas' reserves. Purchase price was close to $2 million.

Apex has nearly 3 million barrels of proven crude reserves, most of it in West Wilmington and Signal Hill fields. Total production is 1,000 bbl. daily after royalties and partnership interests are paid. Included in the assets of Apex is a 2 per cent interest in the Long Beach Oil Development Corp., the contracting operator on harbor acreage for the city of Long Beach. The firm is producing nearly 30,000 bbl. of oil a day from 715 wells on the Long Beach acreage.

South Louisiana Production Co. has bought seven gas wells, a gathering system, and 6,800 acres of leases in Holly field of De Soto Parish, Louisiana. The deal with Renown Corp., a subsidiary of Holly Corp., involved in excess of $450,000. About one-third of the acreage is proven. Reserves are estimated at 10,000,000 M.c.f.

A pipeline will be built from Holly field to Mansfield where it will tie in with Louisiana Interstate Gas Corp.'s pipeline. Both South Louisiana Production and Louisiana Interstate are subsidiaries of Central Louisiana Electric Co., Inc.

The Petroleum and Natural Gas Conservation Board of Alberta has officially changed its name to Oil and Gas Conservation Board.

Two more men were indicted last week by a United States grand jury in Pittsburgh in the theft of Gulf Oil Corp. exploration maps.

The men, H. Houghton Phillips, 58, San Antonio, and Charles W. Washburn, 51, Allison Park, Pa., were charged with conspiring to transport stolen maps, showing potential drilling sites, across state lines. Odie Seagraves, Houston, two New Yorkers, and a fourth man who has not been apprehended, were indicted earlier on a similar charge.

Value of the stolen maps has been estimated at $34,450,000.

Guy Lombardo, the orchestra leader, has sold his Texas oil properties to Cataract Mining Corp., Phoenix, Ariz. The $1,508,000 deal included 10 producing oil wells and one gas well in Eastland County, Texas, and

439 acres of proved oil lands in Wichita County.

The Lombardo interests, known as KLB Oil Associates, in turn have gained option to buy 1,500,000 shares of Cataract stock at $1 per share. Lombardo was elected a member of Cataract's board of directors.

The atom will come up for prime attention at the Fifth World Petroleum Congress to be held in New York in 1959. At a meeting of the permanent council in Frankfurt, Germany, the program was outlined. The use of radioactive isotopes and atomic energy in exploration and processing will be covered in a symposium. Exploration for new oil sources, new mathematical techniques in oil production, and the sulfur problem in petroleum will also be covered at the meeting.

The Board for Lease of University Lands is considering a sale of oil and gas leases on University of Texas lands in West Texas in late September or early October. The board asks that operators designate university tracts which they would like to have offered for lease. The lists of tracts, set down numerically in order of operator's choice, should be submitted by August 1 to Berte R. Haigh, University Lands, Midland.

Tidewater Oil Co. will take over five floors in a 22-story building to be built in midtown Manhattan when it is completed in 1958. The building will be built by the Getty Oil Co., which is headed by J. Paul Getty. It will be known as 660 Madison Avenue and will be on the corner of Madison Avenue and Sixty-first Street. The new building will adjoin the Pierre Hotel, which is owned by J. Paul Getty.

The fourth major water flood for Blackwell Oil & Gas Co. will get under way about August 15 at Happy Valley field, Lincoln County, Oklahoma. Final step was taken last week when Blackwell bought a controlling interest in 31 wells and 400 acres from Foster Drilling Co., Cushing, Okla.

The flood will cover 700 acres on a five-spot basis. The Bartlesville sand has already yielded 2,800,000 bbl. of oil by primary means. No estimate was given on expected secondary recovery. Blackwell's other three large-scale floods are also in the Cushing area.

watching WASHINGTON

. . . with Bertram F. Linz

After civil rights, leftovers . . .

THERE isn't much chance of many oil measures getting through Congress this year. From now on, the civil-rights fight will engross the Senate to the exclusion of all else.

Senate leaders say the fight may go on for anywhere up to 8 weeks or more. The daily sessions will get longer as the argument grows. Toward the end they may run round the clock. When it is over the senators will be out of sorts, tired, and ready to quit.

With this roadblock in the Senate, the House is expected to pass its bills—the Harris gas bill among them—and then take off.

A number of bills of interest to the oil and gas industry will be caught in the jam. Statehood for Alaska and opening of its offshore lands for leasing will be among them. So will the curb on military land grabs, aimed at liberating leaseable areas on the outer Continental Shelf, and the future of government research on shale-based synthetic liquid fuels.

These and a lot of other bills less important to the industry will be piled up at the Senate's door when it returns next January. With that backlog, next year's session will be by far the most important.

Concentrated oil—or is it? . . .

A LENGTHY report on concentration in industry may shortly come out of the Senate antitrust subcommittee headed by Senator O'Mahoney.

The report—a staff job—may turn out to be a "yes and no" affair. It is expected to show that the very largest companies accounted for less of the over-all oil business in 1954 than in 1947. That may be due, in part, to the Government's industry-expansion program which gave independents a chance to spread out.

At the same time, the report may show that the top companies continue to hold a dominating position in specific fields—such as gasoline.

Either of these conclusions will be subject to discount. If there was any increase in concentration in the oil industry between 1947 and 1954 it was much less than in a number of other industries and probably less than in industry as a whole.

There are other factors, too. The degree of concentration could vary, depending on whether imports are counted in or out. And just how plants are classified might also make a difference.

Worry, service, and rewards . . .

WHEN Robert B. Anderson takes over as Secretary of the Treasury sometime in the next few weeks he will also take over a lot of headaches.

His biggest one will be the handling of a fat national debt of nearly $275 billion that just won't lose weight. Another headache, big in this industry, is that of the depletion allowance for oil and gas and taxes generally. And there are others—lots of them.

Whether what Anderson gets in return is worthwhile, only he will be able to say. The biggest reward, in his mind, undoubtedly will be the satisfaction of having served his country. For on the material side, the richest nation on earth isn't very generous.

Anderson will have an air-conditioned office in which to sweat out his problems. He will have a fine, big automobile and a man to drive it. More important by far in traffic-crowded Washington, he will have a place to park it. His name will go down to posterity—for a few years—as a signature on our paper money. He will be entertained a lot. In turn, he will have to do a lot of entertaining.

And on top of all this he will get $25,000 a year in cold cash—less taxes, of course.

BRINE-INJECTION units such as this one in Basin City field are solving a problem as . . .

California Acts to Cut Water Pollution

BAKERSFIELD.—Agriculture is growing in the San Joaquin Valley of California—and so are the problems of the oil operators.

Farmers who thirst for pure irrigation waters have invaded the western side of the valley. And they don't want the briny waste from oil wells threatening their crops.

This development is forcing operators to change their ways. The brackish water they once allowed to run down natural drainage to seepage pits must now be returned underground or channeled to percolation pits.

To make matters more difficult, the oil fields in San Joaquin Valley are producing an increasing amount of water every year.

Figures help to tell the story:

. . . Water output has risen steadily over the past 5 years, and it now stands at 1,275,000 bbl. daily. Much of the flow can be used for irrigation, but the rest must be disposed of—at a price.

. . . The amount returned underground more than doubled the past year—from 61,000 bbl. daily a year ago to 140,000 today. Some of this injected water is valuable in secondary recovery, but more than half is injected just to get rid of it.

. . . Another 200,000 bbl. daily is run to percolation-evaporation pits in areas where subsurface waters are so saline they can't be used for farming. This figure will be increased by 100,000 bbl. when new projects are completed.

If it were economically feasible, operators would like to pipe the waste water to the ocean. But it isn't. Local disposal is the only answer.

The problem wasn't such a stickler when farming was confined to the eastern side of the valley. In those days, the waste water was run to lease sumps or gravitated down natural drainage to seepage pits.

But today's agricultural activity has changed all that. The valley's economic life depends on freshwater supplies, and the operators are making long-range and costly plans to dispose of water with mineral content destructive to crops.

SAN JOAQUIN VALLEY WATER DISPOSAL PROJECTS

Field—	Injection wells	Bbl. daily injected
Burrel	2	2,500
Buena Vista Hills*	6	1,000
Coalinga, East*	12	3,600
Coles Levee, North*	1	1,000
Cuyama, South*	2	11,800
Edison	2	8,000
Greeley*	5	9,600
Gosford, East	1	3,000
Helm-Lanare	3	6,500
Lost Hills*	4	1,300
Mountain View	1	2,800
Raisin City	8	40,000
Rio Bravo*	3	7,500
Riverdale	2	5,000
Rosedale*	1	1,100
Rosedale Ranch	1	2,900
Russell Ranch*	8	22,000
Ten Section	1	3,600
Tejon Hills*	6	4,300
Others	6	2,200
Total	75	139,700

*Water injected into oil-bearing formation.

The state's position . . . The state Water Pollution Control Board has adopted a reasonable attitude toward the problem of the operators. Where pollution threatens, the board is asking that waste water be returned underground or moved to areas where it can seep into formations already containing brackish water.

As long as operators show reasonable progress in correcting potential pollution, the board has been cooperative. It has yet to resort to legal action to enforce recommendations.

Valley waste waters vary widely in quality. They may be entirely suitable for agriculture, as in the old Kern River field, or they may carry the same amount of minerals and salts as in sea water. The wide range may exist within a single field. Thus the operator not only is concerned with location, geology and agriculture but must also worry with the quantity and type of dissolved solids in the waste water produced.

When the pollution board makes a recommendation on disposal of waste water, it considers composition of the water and location of the field. Unlined percolation pits usually are authorized where the water is low in chlorides, sodium, and boron and is produced in a nonarable area made unfit for farming by ground waters.

But where the field is near farming and pollution of the land and ground waters is threatened, the board applies continually increasing pressure until the water is properly disposed of.

Where it's toughest . . . Older fields offer the biggest problem. They are the large water producers. Many small operators are in the older fields, and most of the wells are marginal. A high disposal bill could make them uneconomical.

Five such fields are the Coalinga, Kern River, Midway-Sunset, Mount Poso and Round Mountain. Each accounts for 100,000 bbl. of water daily or more. Others in the classification run the figure to 700,000, thus accounting for well over half the valley's total.

Fortunately there is no problem presented by the 135,000 bbl. produced by the Kern River wells. Relatively fresh and sought after by farmers, the waste needs only to be skimmed to qualify as irrigation water. The average well in the field produces 500 bbl. of water with each 5 bbl. of oil.

Where injection works . . . The accompanying table shows the amount of water injected in valley fields. Most are in central valley and eastside fields.

Bulk of the new injection facilities have been in Fresno County's Burrel, Helm-Lanare, Raisin City and Riverdale fields. Of the 77,000-bbl. output of water daily 55,000 bbl. is being injected.

Raisin City operators have been particularly active and have held several meetings with the regional pollution board. A year ago only three plants disposed of 16,000 bbl. daily. By June of this year eight plants were disposing of 40,000 bbl., and last month the field's entire output of 45,000 bbl. was going underground.

Injection facilities also have been added this year in Edison and Mountain View fields east of Bakersfield. Three plants are returning about 10,000 bbl. of the fields' 52,000 bbl. of brine production. Some of the Edison water is relatively fresh, and it is blended with irrigation water.

Where percolation works . . . Westside field operators and those in the Coalinga area generally are disposing of their waste waters in percolation pits. Little is returned underground, and most of this is associated with pilot floods.

In the southern sector of the westside, the alluvial and Tulare (Pleistocene) waters are too saline for domestic or agricultural use, and for this reason there is no pollution when brines are run to seepage pits located in outcrops of these formations. This area generally is south of Lost Hills. However, north of Lost Hills, the alluvial and Tulare waters are usable, and this means that seepage pits must be located on lower San Joaquin or Etchegoin outcrops.

Though referred to as percolation pits, evaporation plays an important role in disposal. In the southern westside, humidity is low and annual rainfall averages about 4 in., and evaporation will account for approximately 50 in. annually.

Midway-Sunset is the largest westside water producer. It's 3,600 wells put out 106,000 bbl. daily, and nearly all of it runs down ditches and gulleys to catch basins. This system has worked for years without danger of pollution because there was no farming in the seepage pit area.

But conditions have changed. Agriculture has encroached, and pollution is possible if the waters are not confined west of Buena Vista Hills. Thus last year a $125,000 program to provide new percolation pits was started in the area. The new pits now handle 95,000 bbl. daily. Water from wells in the Maricopa area still presents a disposal problem.

Since most Midway-Sunset wells are owned by small operators, construction of the percolation pits had to be a cooperative undertaking. The operators used the Valley Waste Disposal Co. and shared the cost. The company already was active in other areas.

In nearby Elk Hills field, the Navy department is moving 29,000 bbl. of water westward daily because of encroaching farming. The waste water must be pumped from two central tank farms to the disposal pits, and the undertaking is a costly one. About $250,000 was spent for percolation pits, piping and pumps.

More to be done . . . The worst potential pollution spots are under control, but the job is far from complete. Operators in the Fruitvale field, on the edge of Bakersfield, probably will have to discontinue use of lease sumps for handling the field's 22,000-bbl. daily output.

Buena Vista Hills operators also are planning to change the method of handling their 27,000-bbl. water output.

The Water Pollution Board likewise is not satisfied with disposal methods used at some leases in Edison and nearby fields. To correct this, operators may build a pipeline system to gather the water and transport it to the Sierra Nevada foothills.

In the foothills the water would percolate into older formations which, in the valley, lie at depths of several thousand feet. The project, if carried out, may handle up to 75,000 bbl. daily.

In 4 years, the oil operators of San Joaquin Valley have spent $3 million on water disposal—not counting the water-flood projects. They'll be spending money like that for years to come.

Big Difference Crops Up in Evaluation of Area off California

SANTA BARBARA, Calif.—How much is 49 sq. miles of ocean worth off the coast of Santa Barbara?

This question is the key to a squabble between state and city over Santa Barbara's recent annexation of offshore acreage. The city annexed a 3-mile-wide strip of ocean to keep drilling away from its fancy residential and recreation areas (OGJ, June 10, p. 76).

The State Lands Commission has asked the state attorney general to file a test case against Santa Barbara's offshore move. Santa Barbara says the offshore area is worth only $1.6 million. The state says the potentially oil-rich area is worth much more —$40 million.

So the state will attempt an injunction against the city's annexation, and if successful, the lands commission will try to have the annexation declared invalid.

But here's the hitch: California laws say an incorporated city can annex contiguous territory if the city has holdings within the territory worth more than 50 per cent of the value of the annexed area.

In this case, Santa Barbara owns an airport on the small onshore portion included in the annexation. It's worth $5 million. And the city has the right to set the value of the land involved.

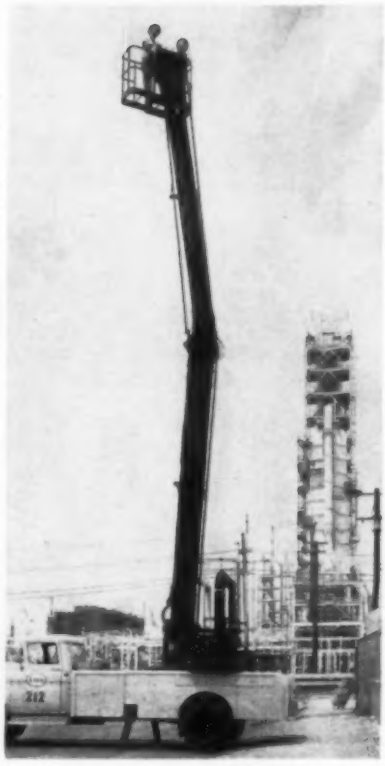
Mobile Scaffold Zips Up Maintenance

BATON ROUGE.—Esso Standard Oil Co. has a new system for getting workmen to high places in a hurry at its 352,000-bbl. refinery here.

A mechanical "giraffe" is replacing ponderous scaffolding on jobs up to 50 ft. in the air. The mobile arm, operated by a hydraulic pump, can swing in a 360° plane and stop at any level up to its full height. Controls are manipulated by the workmen in the basket at the end of the arm. The truck-mounted giraffe can be moved quickly from one location to another.

Esso's mechanical "giraffe" . . .

Swings men into position . . .



For work 50 ft. in the air.

Florida Refinery Put on Shelf

DENVER.—A cloud of doubt has settled over plans of Seminole Oil Co. to build a 15,000-bbl., $16-million refinery at Fort Pierce on the east coast of Florida.

This was disclosed last week by Frontier Refining Co., Denver, which holds 20 per cent of Seminole stock and an agreement to operate the proposed refinery.

"We still are working on financing the project," said H. E. Armitage, vice president of Frontier. "We haven't given up the idea. We still think it is sound."

Sam Butler, Jr., president of Sharples Oil Co., Denver, and vice president of Seminole, described the proposed undertaking as "dormant," but declined further comment.

Seminole was formed 2 years ago to build the refinery on a 150-acre site 3 miles inland on the Florida coast. Frontier said then that construction would start "almost immediately, as soon as financing is completed."

Sharples Oil Co. was to supply 15,000 bbl. daily of low-gravity crude from the Tampico and Tuxpan areas of eastern Mexico under a 10-year contract.

Nearly 100,000,000 gal. of gasoline was to be produced annually at the Fort Pierce refinery and marketed under the Seminole trade name through 200 service stations to be built or acquired in Florida, south of Orlando.

Plans for the refinery were first disclosed 5 years ago by M. H. Robineau, president of Frontier Refining. Proposed sites at West Palm Beach and Jacksonville were abandoned because of public opposition before the Fort Pierce property was acquired.

Texas Natural Branches Out

TULSA.—Texas Natural Gasoline Corp. has made its first move into crude production. The Tulsa firm purchased an undivided three-quarter interest in 1,850 acres in Oklahoma and Kansas from Layton Oil Co. of Independence, Kans., and George B. Emery, Jr., of Topeka.

The leases are producing about 600 bbl. daily from 72 wells ranging in depth from 700 to 2,200 ft. Texas Natural's share of production will be about 450 bbl. daily. The leases are in Washington, Creek, and Osage counties of Oklahoma and Montgomery, Elk, and Russell counties of Kansas. A large expansion program is under way on water floods in the areas. Layton Oil Co. will continue as the operator.

Texas Natural produces some 20,000 bbl. daily of natural-gas liquids at seven plants in Texas and one in eastern Montana near Glendive. The Montana plant has a capacity of 1,000 bbl. daily.

Union Maps Record Drilling

LOS ANGELES.—Union Oil Co. of California plans a record 6-month drilling program for the last half of 1957.

This includes 110 development wells and 58 wildcats, some of which will be joint ventures. In addition, Union will participate in 80 other projects to be drilled by other companies.

As usual, the largest part of the investment will be for development wells in California, but a much greater effort will be made in developing out-of-state areas.

Exploration will be concentrated in South Louisiana and off the Gulf Coast. Eighteen wildcats will be drilled there. Foreign operations will include tests in Costa Rica, and preliminary work in Guatemala. Union is currently participating in an Alaskan venture.

Journal Again Expands Staff

HOWARD M. WILSON, Oklahoma political writer for the United Press for the past 10 years, has joined the news staff of The Oil and Gas Journal.

Wilson is a net addition to the Journal's editorial staff, already the largest by far in the petroleum industry. He will be employed in the Journal's headquarters offices in Tulsa.

The addition is designed to further strengthen the Journal's comprehensive coverage of world-wide developments in the oil industry.

Wilson is 41 and holds a master's degree in journalism from Columbia University, New York. He was recipient of the Sigma Delta Chi award as the outstanding journalism graduate when he received his bachelor's degree in 1938 from the University of Oklahoma.

Before joining United Press he had operated his own press service from the Oklahoma state capitol and previously had served on the editorial staffs of the Daily Oklahoman, the Tulsa World, and other publications in Oklahoma and New York.

HOWARD M. WILSON

Taft-Hartley Violation Charged:

Sohio Sues Striking O.C.A.W.

CLEVELAND, Ohio. — Violation of the Taft-Hartley Law was charged here last week by Standard Oil Co. of Ohio in a damage suit filed against the Oil, Chemical, and Atomic Workers International Union.

Sohio is suing O.C.A.W. for $856,000 in a case pending in federal District Court. The company says the union engaged in secondary picketing on a construction project at Sohio's strike-bound Toledo refinery.

The Toledo refinery and several other Sohio plants have been shut down by striking O.C.A.W. workers for more than a month. The disagreement stems from renewal of Sohio's wage contracts with O.C.A.W.

The company is building a new 60,000-bbl. plant adjacent to the present 23,000-bbl. refinery at Toledo. Sohio claims that the union has extended its picket line to a gate assigned exclusively to contractor employes.

By massing at the gate, the pickets have interfered with members of the craft unions employed on the construction project, Sohio says. The complaint charges that the picketing and other alleged activities of the union was for the purpose of inducing craft workers to halt work on the multimillion dollar construction job.

Sohio also says the pickets blocked railroad and truck shipments of construction materials delivered to the plant. The damage claim is based on delay in the construction of the new plant, and additional costs resulting from craft workers walking off the job.

The company's troubles with O.C.A.W. extend to the 52,000-bbl. Cleveland refinery, the 47,000-bbl. plant at Lima, and the 16,000-bbl. plant at Covington, Ky., which are all shut down because of wage-contract disagreements.

Most other oil companies have settled with organized labor for a 6 per cent wage increase this year, retroactive to May 1, with 5 per cent retroactive to April 1.

Four Corners Sale Set

WINDOW ROCK, Ariz. — A big chunk of land in the middle of the hot Four Corners area has been booked for sale by the Navajo Tribal Council.

The Navajo agency is offering 370,000 acres in Arizona and Utah, much of it a stone's throw from production. It figures the land is so valuable it is breaking from its usual procedure of giving only 30 days' notice before the sale. This time it is putting the word out 6 months in advance "to give more companies a fair chance to submit bids." The sale date is November 15.

The Arizona land, making up about two-thirds of the total, is in the northeastern tip of the state where the four borders come together. The Utah offering is backed up against the Arizona border, with the eastern limit some 25 miles from Colorado.

Air Pollution Cut

Esso shows local officials what it has done at Linden

LINDEN, N. J.—Esso Standard Oil Co. has cut air pollution at its Bayway refinery by 65 per cent in the last 5 years.

This was the story told to state and municipal officials of New Jersey during a tour of the refinery at Linden last week. New Jersey is gradually tightening its antipollution regulations.

The officials learned that Esso is whipping the pollution problem by using such devices as ultraviolet lights, vacuum trucks, cyclones, and floating-roof tanks.

Five years ago Esso determined that the chief sources of potential pollution were combustion operations, evaporation, and escaping catalyst dust of fluid catalytic cracking. Since then, pollution from combustion has been reduced by 80 per cent. Evaporation pollution is down 50 per cent, and the amount of catalyst escaping has been cut 40 per cent.

Combustion control was accomplished by reducing gas burning in flare stacks by 85 per cent. Evaporation pollution was cut principally by installing floating-roof tanks. The refinery now has 35. And Esso is now recovering up to 99.995 per cent of its catalyst fines through use of harder microspheroid catalysts.

The biggest contribution to Esso's success against pollution has been its control of sulfur. Sulfur-recovery units have been installed, and the use of high-sulfur crudes has been reduced. Where high-sulfur crude once constituted 35 per cent of the total charge, it now is down to 10 or 15 per cent.

Ultraviolet lights are used by Esso at the Bayway plant to detect spills not seen by the naked eye. The device is particularly effective at night. Esso conducts safety checks around the clock at intervals of 2 or 3 hours, and four vacuum trucks, which operate like vacuum cleaners, are sent through the refinery to clean up spills as fast as they occur.

A legendary oil figure:

. . . Hugh Roy Cullen Dies

HOUSTON.—One of the oil industry's legendary figures, Hugh Roy Cullen, died last week at a hospital here. He was 76.

His final sickness closed a full and active life for Cullen. He was known to his friends and business associates as a man of great contradictions. They count off a few:

. . . A top-notch wildcatter, Cullen was known for his humility.

. . . Owner of a fortune worth more than $200 million, Cullen found joy in giving $180 million of it away during his life. Beneficiaries were school, college, hospital, medical, and charitable enterprises.

. . . Lacking a formal education—he attended the first three grades—Cullen felt keenly the importance of schooling. He earmarked the bulk of his gifts to the University of Houston.

HUGH ROY CULLEN
. . . his philanthropies hit $180 million

A quiet crusader . . . Cullen remained active until a few months before his death.

His philanthropies filled much of his time in late years. But in addition to these and his business activities, Cullen devoted much of his energy and time to what he called his greatest fight: A battle against the threat of socialism and communism.

Cullen often said that of the two he felt socialism actually was the greatest threat. It is easier to put over on the people, he observed.

He received many honors recognizing his achievements and contributions to the oil industry and to American institutions. The University of Pittsburgh honored him with an honorary doctor of science degree as one of the foremost authorities on oil structures in America. Baylor University and the University of Houston also honored him with honorary degrees. Similar honors came from medical and hospital groups, the Veterans of Foreign Wars, and the Mid-Continent Oil and Gas Association.

Long career . . . Cullen was born in Denton County, Texas, July 3, 1881. His family moved to San Antonio when he was 6 months old.

At 12, Cullen started his business career by working in a candy store for $3 a week. He had a variety of jobs until he was 17, when he went to work for a cotton broker. A year later he had learned so much about the cotton business that he was representing a cotton factory for Texas and Oklahoma.

Cullen continued to show a business acumen that characterized him throughout life. By 1904 he had established his own cotton business in Oklahoma and in 1911 returned to Texas and became a member of the Houston Cotton Exchange.

About this time Cullen became interested in the real-estate business. This in turn led to his interest in oil. Since Cullen only had a modest income at the time, he was not able to get enough capital together to lease potential oil property until 1918.

When he did enter oil, he did so in a big way. By 1921 he had leased a million acres and had made an oil strike at Pierce Junction near Houston. But this first success came only after some disappointments. He knew the feel of bringing in dusters, too. He drilled the deepest well in Texas at the time—it turned out to be the deepest dry hole. Two others in a row also came in dry before his breakthrough at Pierce Junction.

Cullen was a natural at buying leases. His simple, honest nature paid off with ranchers and farmers. While many of the ranchers backed away from the smooth talking "slickers," they warmed to the cotton man who admitted he knew little to nothing about oil. And he got the leases.

Cullen became an expert at developing new areas or deeper sands in proven but shallow fields. Some of these fields now famous in Texas were Damond Mound, Humble, Blue Ridge, Thompson, and Tom O'Connor ranch in Refugio County. Discoveries and developments such as these earned for Cullen the reputation of being the most conspicuous example of a successful wildcatter in Texas.

Cullen in the early 1930's formed Quintana Petroleum Corp. in Houston to handle his holdings. He remained its president until his death.

Pricing Method Hit

FPC must study increases by pipeline to affiliates

WASHINGTON.—A federal court ruled last week that the Federal Power Commission should check price increases paid by pipelines to affiliated gas producers before allowing them to be passed on to pipeline customers.

The U. S. Court of Appeals for the District of Columbia ordered the FPC to "inquire into the reality" of increases paid by United Gas Pipeline Co. The court acted on an appeal of the Mississippi River Fuel Co. from an FPC order approving an increase which the fuel company said would cost it some $1,350,000 a year.

The higher tariff was based in part on prices paid by United to Union Producing Co., an affiliate. The court said the price paid is set by the two companies without regulatory restriction and was not an arm's length transaction.

The court held that the FPC "must at least inquire into the reality of the price increases paid by Union to its wholly owned and partially owned affiliate producers." The court said the "increases were in part reflected in the United-Union prices."

"By this we mean that to include the increased prices in the costs of United, the commission must at least determine that the increases had sufficient factual economic justification; it must ascertain that they were not mere bookkeeping or intracorporate system adjustments."

Gas Lines Due for a Big Year

WASHINGTON.—The total operating revenue for the interstate natural-gas business will hit a whopping $3 billion in 1957. This is indicated in a recent survey by the Federal Power Commission.

In 1956, operating revenues totaled $2,941,000,000, on sales of 9.16 trillion cubic feet of gas. Most of this —$2 billion—was reported by the 36

pipeline companies which file monthly returns with the FPC.

These companies sold 7.43 trillion cubic feet of gas last year. The remainder was sold by companies which sell less than half of their gas for interstate commerce.

Net operating revenue, after deductions, was $335,286,000 for the 36 pipeline companies, out of a total of $441,082,000. Net income was $241,479,000 for the pipeline companies, out of a total of $372,209,000.

New Pay Discovered

Amerada may have first Winnipegosis production

WILLISTON. — Amerada Petroleum Corp. may have discovered the first oil pay from the Devonian Winnipegosis formation in the Williston basin.

This possibility will depend on further testing of the company's 1 West, a confirmation test to Outlook-Silurian field in Sheridan County, northeastern Montana.

The additional testing is needed to determine the age of the pay section. The oil may have come into Devonian rocks from Silurian through fractures.

Amerada took a drill-stem test at 8,991-9,059 ft. The test recovered 1,500 ft. of oil-cut water cushion, 790 ft. of heavily oil and gas-cut mud, 1,530 ft. of oil, and 720 ft. of mud and gas-cut oil.

The 1 West is a confirmation attempt to the prolific 1 Tange discovery well. The 1 Tange flowed 2,742 bbl. of oil per day from the Silurian earlier this year.

Other Outlook field activity includes the 1 Norager, a southeast extension and the 1 Grinker, a northwest extension. Production in the general Outlook area is from Silurian and Red River-Ordovician.

San Joaquin Sells Five Rigs

LOS ANGELES.—San Joaquin Drilling Co. has sold five of its six rigs to the newly formed Republic Supply Equipment Co., a subsidiary of Republic Supply Co. of California.

The remaining rig, a National 110, will be transferred to Sun Drilling Co., according to W. W. Cline, president of San Joaquin and a general partner in Sun Drilling.

Republic Supply Equipment was formed as part of a large-scale move by Republic Supply into the used-equipment rental and sales field.

About a year ago Republic launched this program by acquiring 16 rigs from Thomas P. Pike Drilling Co.

Pipeline briefs

Construction will begin soon on a 60-mile, 10-in. products pipeline from Port Everglades, Fla., to Miami's International Airport. Buckeye Pipe Line Co. and Cities Service Co. are principal owners of the line, which will have capacity of 60,000 bbl. per day. The $4-million project will be in operation late this year.

The line will transport jet fuel, avgas, and possibly motor fuel. It will serve the marketing needs of metropolitan Miami and the airport. Buckeye will build and operate the line.

Natural Gas Pipeline Co. of America has awarded contracts for the remaining sections of the 350-mile line from Bridgeport, Tex., to Fritch, in the Texas Panhandle. River Construction Corp. will have two spreads totaling 173 miles from Mountain View, Okla., to Fritch. Work on these sections will start in August.

H. B. Zachry Co. has the remaining 87 miles of 26-in., located between Healdton, Okla., and Mountain View. The 90-mile, 20-in. section, from the southern terminus at Bridgeport, Tex., to Healdton, was awarded previously to Eastern Pipeline Contractors, whose spread is already at work. The line, to be completed by January, will have capacity to deliver 240,000,000 cu. ft. daily into Natural's main line at Fritch.

Northern Ontario Pipe Line Crown Corp. has let contracts for the Winnipeg River crossing near Kenora, Ont., to River Construction Corp., Ltd. The contractor will start work on the job this week. Completion is due by November 15. Two 30-in. lines will be laid under the stream.

Westcoast Transmission Co., Ltd., is rapidly winding up its 650-mile, 30-in. gas line from Peace River to Sumas, Wash. Bechtel Corp. will complete 66 miles of 30-in. from Fort McLeod to Pine Pass, B. C., August 20. Two pipeline bridge crossings will be completed the last half of this month by Marine Pipeline & Dredging, Ltd. They will span the Fraser and Peace rivers near Flood and Fort St. John, B. C.

Great Lakes Pipe Line Co. has started work on several phases of its major expansion program. Contracts have been awarded on the following projects: Midwestern Contractors, Inc., and M-R Co., 69 miles of 12-in. from Middlebury Junction to Chicago; Midwestern Constructors, Inc., 34 miles of 12-in. from Tulsa to Barnsdall; and R. H. Fulton & Co., 93 miles of 8-in. from Chippewa Falls to Eau Claire, Wis. The projects will be completed this year.

Pacific Northwest Pipeline Corp. has received temporary Federal Power Commission approval to lay 112 miles of laterals to make sales to three industrial customers. The company plans 34.5 miles of 6 and 4-in. from Snohomish County to Grotto, Wash.; 41 miles of 6-in. from Coeur d'Alene to Kellogg, Idaho; and 36.9 miles of 8-in. from its Spokane lateral to Moses Lake, Wash.

Service Pipe Line Co. is receiving pipe at rail points along the right-of-way of a 165-mile, 10-in. crude line from Griffith, Ind., to Muskegon, Mich. Service will build and operate the 26,000-bbl. daily line for Muskegon Pipe Line Corp., owned by Service and Aurora Gasoline Co. Actual construction is to begin in August.

Ohio Fuel Gas Co. has let contract for 27 miles of 20-in. to O. R. Burden Construction Corp., Tulsa. The project, along the company's existing system in Ohio, starts at Wellston and extends southward. Another project, 27 miles of 24-in., will be let soon. The company has filed for Federal Power Commission authority to build 53 miles of new line costing $3,594,000 to expand service to Toledo and other cities in Ohio.

Also for Pipeliners . . .

The Harris bill has cleared its first committee hurdle, now must pass rules committee test before reaching House floor (p. 60) . . . Texas Eastern offers to swap its stock for La Gloria Oil & Gas, strengthening pipeline firm in oil-gas production and processing (p. 62) . . . Southern Pacific has completed first section of its new 350-mile products line (p. 74) . . . Crude has begun moving over a new 12-in. pipeline linking Venezuela's Aguasay field with Puerto La Cruz (p. 81).

PLUS THESE TECHNICAL FEATURES: Pipeline river crossings, second of three parts (p. 96) . . . and Pipeline Patrol reports on Sicily's toughest pipeline project (p. 131).

Smog Threat Easing

Spending program showing results; no alerts in 1957

LOS ANGELES.—The bill for Los Angeles' 9-year struggle to rid its air of smog now totals $72,770,000.

Experts estimate another $300 million will be poured into the battle in the next 5 years before Angelenos can breathe smog-free air month after month.

The huge spending program is beginning to pay off.

There have been no smog alerts this year. Last year there were 10. In 1955 there were 15.

The Los Angeles Air Pollution Control District released its annual report last week showing industry has anted up the most money by spending more than $50 million for air pollution control installations at refineries, tank farms, smelters and other heavy industries.

The Air Pollution Control District has spent $10,320,000 on engineering, inspection and research. The balance of the $72,770,000 outlay has been spent by private research organizations.

The report estimates that in the next 5 years $150 million will be spent on exhaust-control equipment for automobiles, now considered the major contributor to the smog problem. Another $45 million will be spent on refuse collection and disposal. The APCD and private groups will put out $30 million on research and development of smog arresting devices and techniques.

Of the $50 million spent by industry generally during the past 9 years, the oil industry contributed more than $24 million at refineries and more than $3 million at tank farms to eliminate air pollutants.

Refinery Will Be Expanded

WOOD RIVER, Ill.—Standard Oil Co. (Ind.) will increase capacity of its 50,000-bbl. refinery here by 30 per cent. Construction will start within 3 months on a 67,500-bbl. crude distillation unit and a 30,000-bbl. fluid cat cracker.

When completed in 1959, Indiana Standard will retire present crude units, a 19,000-bbl. fluid cat cracker, 10,200-bbl. of gas-oil cracking, a 3,400-bbl. visbreaker, a 7,000-bbl. thermal reformer, and a 3,740-bbl. batch coking unit. Arthur G. McKee Co., Cleveland, is prime contractor.

In addition to the crude units, vapor-recovery facilities now in use at the plant will be dismantled when the new units go on stream.

Processing briefs

The first commercial isomerization unit for exclusive treatment of n-hexane is going in at Atlas Processing Co.'s 19,000-bbl. refinery at Shreveport. The unit will use the Penex hydroisomerization process licensed by Universal Oil Products Co. Capacity will be 3,500 bbl. daily.

Several other Penex units are in design and construction stages and will have capacities ranging up to 35,000 bbl. daily, but they are not designed to treat n-hexane exclusively. Atlas' unit is expected to go on stream in early 1958. The Penex process isomerizes paraffins in the presence of hydrogen and dual-function catalysts.

Ethyl Corp.'s Baton Rouge plant was struck July 9, but supervisory employes kept it operating. The strike was called by Local 12900 of United Mine Workers, which represents 2,100 of the plant's 4,000 employes. Sole issue in the dispute was changed working assignments in the TEL area. Ethyl said modernization here was reducing manpower requirements but that no layoffs were planned. Ethyl's plants in Houston and Sarnia are not affected.

The U. S. Tariff Commission reports that production of water-soluble type petroleum sulfonate-sodium salt surface-active agents totaled 5,259,000 lb. last year.

Canadian Husky Oil, Ltd., has let contracts totalling $700,000 for a construction program to start this fall at its 4,000-bbl. Fort William refinery. The major item will be a 1,000-bbl. diesulformer, a process developed by Husky Oil Co. for upgrading quality of intermediate products through hydrogenation. Poole-Pritchard, Ltd., has the construction contract.

Utah Oil Refining Co. will spend $16.2 million over the next 5 years to expand its Rocky Mountain interests. Included in the program is a capacity increase of 6,000 bbl. daily at its 30,000-bbl. Salt Lake City refinery.

A $2,125,000 contract has already been let to Fluor Corp. of Los Angeles for a 35,000-bbl. pipe still at the plant. The present still would go on standby. The expansion will also take in bulk plants and service stations. Slightly less than half the money is allotted for these facilities.

American Synthetic Rubber Co. has completed a big expansion program at its Louisville, Ky., plant, increasing capacity from 44,000 to 69,000 long tons annually. The $3,500,000 project included construction of new reactor, recovery, and process facilities. Design, procurement, and construction were handled by Walter Kidde Constructors, Inc.

Monsanto Chemical Co. has begun two more major expansions at its petrochemical center at Texas City. By June 1958, the company will increase capacity of the styrene-monomer plant by 40,000,000 lb. And by early 1958, the plant's acetylene capacity will be increased by 12,000,000 lb.

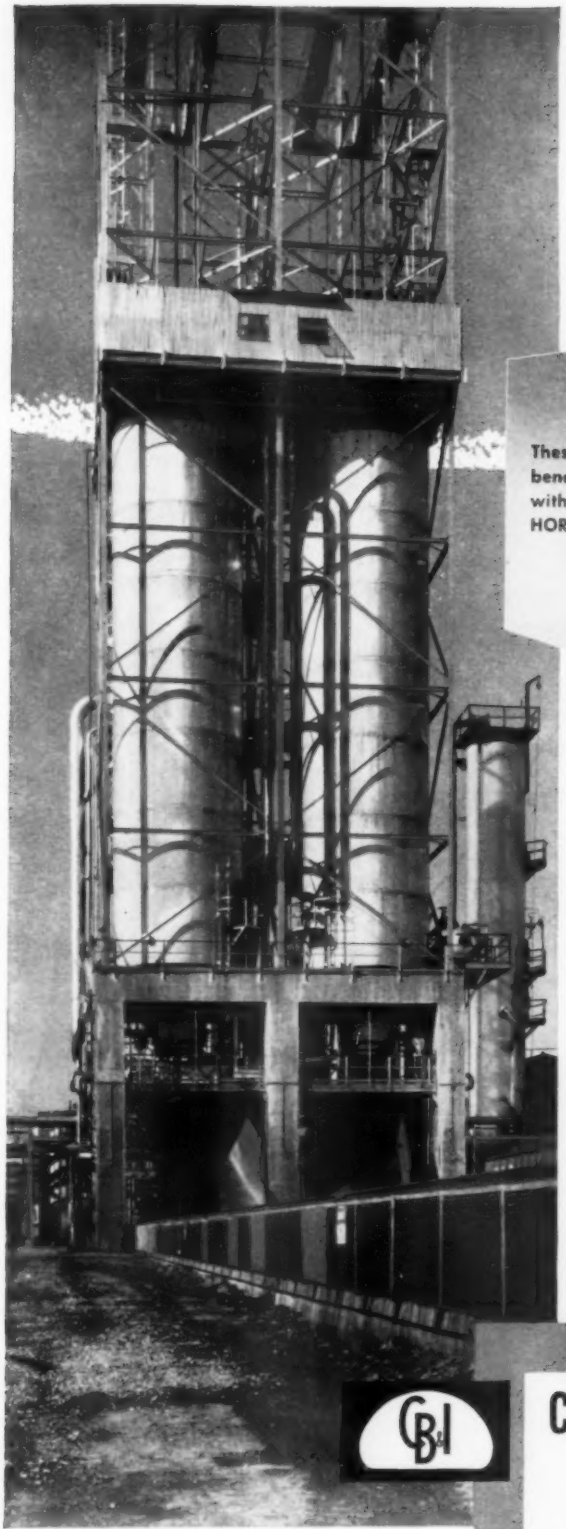
The company later plans to increase the acrylonitrile capacity to more than 100,000,000 lb. Also on schedule is a substantial addition to the firm's polyethylene capacity. Last May, a multimillion-dollar ethylene expansion was completed at Texas City.

Premier Oil Refining Co. has completed a $1,500,000 expansion at its Longview, Tex., refinery. Latest installation to go in was a 1,500-bbl. Platformer and Unifining unit. The plant earlier increased crude capacity from 4,200 to 4,700 bbl. daily and added 300 bbl. per day of thermal-processing capacity. Premier is a wholly owned subsidiary of City Products Corp. of Chicago.

Also for Refiners . . .

The cabinet imports committee is expected to complete a voluntary plan to curb imports and have it going by month's end (p. 61) . . . Texas Eastern's stock swap for La Gloria Oil & Gas puts the pipeline firm into refining and field processing for the first time (p. 62) . . . Final approval has been given by the Ontario Municipal Board for Cities Service and Shell to build two 20,000-bbl. daily refineries near Toronto (p. 63) . . . Plans of Seminole Oil Co. to build 15,000-bbl., $16-million refinery at Fort Pierce, Fla., have hit a snag (p. 68)

PLUS THESE TECHNICAL FEATURES: Absorption factor aids product recovery (p. 88) . . . Solvent, urea combined in dewaxing operations (p. 107) . . . Calculating complex-system gas flow at field plants (p. 112) . . . Questions on Technology (p. 116) . . . The Foreman's Page (p. 118) . . . Field Processing (p. 120) . . . and PETROdatics (p. 122).



HORTONCLAD®

(manufactured by vacuum bonding process)

provides better corrosion protection in clad vessels

These benefits with HORTONCLAD® . . .
• UNIFORM THICKNESS
• HIGH STRENGTH BOND
• CLEAN, CONTAMINANT–FREE SURFACE
• ADAPTABILITY TO ANY SIZE OR SHAPE

Hortonclad, available only in CB&I tanks, pressure vessels and other clad structures, is unlike other clad materials. The bond is accomplished by a flux-free high strength vacuum bonding process producing a clad plate with an integral and continuous bond of exceptionally high strength. Uniform clad thickness results as both alloy cladding and backing are in their final thickness *before* bonding. Silver, stainless steels (both chromium and chromium nickel) nickel and high nickel alloys such as Monel, Inconel, and Hastelloys B and F can be employed in the Hortonclad process.

In corrosive service, Hortonclad permits the use of higher temperatures, concentration and pressures—without the high cost of solid alloy vessels. For further information on its application write our nearest office . . . ask for the *Hortonclad* bulletin.

405 STAINLESS STEEL HORTONCLAD was used in the fabrication of these two 16-ft. diam. by 65-ft. high coking chambers by CB&I.

PS2

Chicago Bridge & Iron Company

Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston
New Orleans • New York • Philadelphia • Pittsburgh • Salt Lake City
San Francisco • Seattle • South Pasadena • Tulsa
Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.
REPRESENTATIVES AND LICENSEES:
Australia, Cuba, England, France, Germany, Italy, Japan, Netherlands, Scotland
SUBSIDIARIES:
Horton Steel Works Limited, Toronto; Chicago Bridge & Iron Company Ltd., Caracas;
Chicago Bridge Limited, London; Sociedade Chibridge de Construcoes Ltda., Rio de Janeiro.

Part of Products Line Completed

SAN FRANCISCO.—Southern Pacific Pipe Lines, Inc., is winding up the first section of its new 350-mile products line this month.

A River Construction Corp. spread is shown laying 8-in. to the Richmond refinery of Standard Oil Co. of California. The 6, 8, and 10-in. products system will extend through Stockton and Sacramento, Calif., to Reno and Fallon, Nev.

River Construction is building the 84-mile segment from Richmond to Stockton. The remaining sections will be completed later this summer.

Southern Pacific, which uses its parent company's railroad right-of-way, got in the pipeline business in 1955 with a products system serving metropolitan markets and Air Force bases between El Paso and Los Angeles.

Gas Field Found

South Mississippi gets another deep discovery

JACKSON.—Deep drilling in South Mississippi got another boost last week.

Skelly Oil Co. and Kin-Ark Oil Co. opened the area's fifth Lower Cretaceous field to be discovered this year with their Dexter wildcat in southeastern Walthall County. It is 4 miles east of Dexter and about 90 miles south of Jackson.

Its Lower Cretaceous pay, in Paluxy sand perforated at 13,516-30 ft., is the deeper of two zones in which the well is completed. The other is in a Tuscaloosa (Upper Cretaceous) sand perforated at 9,622-32 ft.

Both zones produce gas. The Paluxy pay is rated good for 2,900,000 cu. ft. of dry gas daily. The Tuscaloosa pay has an open-flow potential for 38,000,000 cu. ft. of wet gas per day, with a condensate recovery of 20 bbl. per 1,000,000 cu. ft.

This is the first discovery in the county but is just over the line from productive Marion County. It is 6 miles from nearest other production, at Hub.

Hub field, discovered in 1945, currently produces oil from Tuscaloosa sands. It has one Lower Cretaceous gas well, shut in since completion in 1946.

San Juan Given New Oil Trend

FARMINGTON, N. M.—The new Gallup sand oil trend shaping up between Bisti and Blanco in the San Juan basin of northwestern New Mexico has five producers. Three wells were added last week, all in the area just northwest of Gulf Oil Corp.'s 1 Blackrock-Federal Gallup sand gas discovery.

The new additions to this closely watched trend are Western Development Co.'s 1 Holloway, which flowed 324 bbl. of oil per day, and Gulf's 3 Western-Federal, which made 519 bbl. per day. Gulf has another well nearing completion at 4 Western-Federal.

The fast growth of this new area has definitely revived lagging Gallup exploratory interest in the San Juan basin. Since Bisti field was discovered 2 years ago, interest in the Gallup play had subsided somewhat. The new trend is the biggest Gallup sand development since Carson field was opened last year.

The development drilling after Bisti was in a northwest-southeast trend from Bisti past Carson. The Blackrock-Federal gas discovery signaled the birth of another northwesterly Gallup trend between Bisti and the huge Blanco gas area of San Juan.

Gasoline-Plant System Opens

AKRON, Colo.—The first two units of a "satellite" gasoline plant system in northeastern Colorado have been placed on stream by Akron Gasoline Co., Denver.

The system so far includes a $400,000 conventional gasoline plant located 9 miles west of Akron and a $150,000 refrigeration-type "satellite" plant located 45 miles north of Fort Morgan.

The conventional plant processes 2,500,000 cu. ft. daily from Xenia West field. The refrigeration-type plant handles 2,000,000 cu. ft. daily from Black Canyon field. They gather the gas through 3-in. and 4-in. lines from 45 wells.

The two units are the first of a planned multiplant operation under which "satellite" stations separate liquids from casinghead gas in outlying fields. The bulk product is trucked to the Akron plant for further processing and sale. The finished products are sold to Phillips Petroleum Co. and residue gas to Kansas-Nebraska Pipeline Co.

when you must be SURE

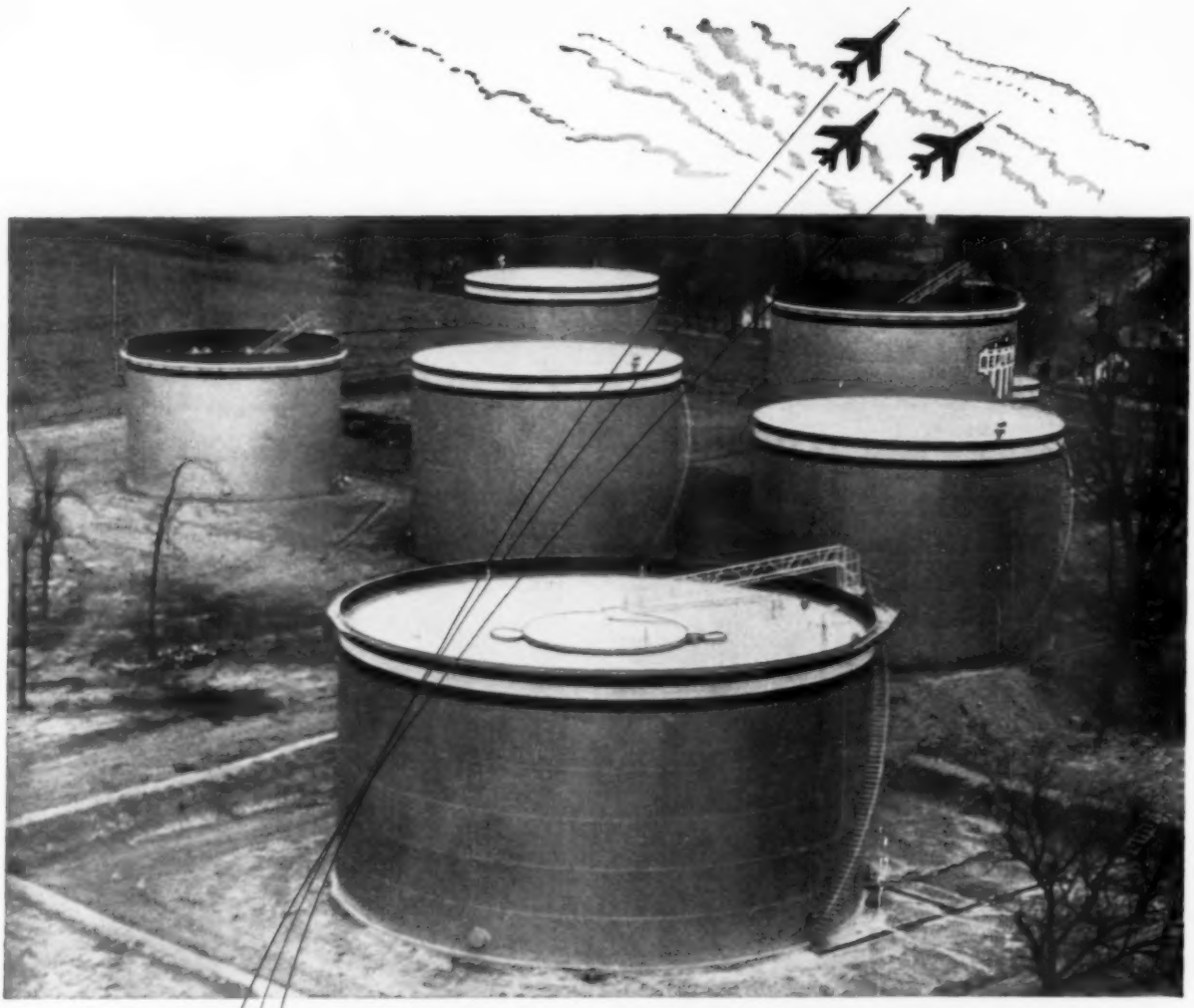
... that a zone, or a section of casing is positively isolated, set a...

BAKER BRIDGE PLUG

- Easily run and set on wire line, tubing or drill pipe
- Ample clearance for fast, safe running-in
- Sets quickly and holds positively
- Provides positive, leak-proof seal
- Cast Iron for permanence
- Magnesium alloy for temporary service
- Shorter body and segmented slips drill up quickly and easily
- Always set promptly and accurately by leading wire line service companies.

BAKER
WIRE LINE
BRIDGE PLUG
PRODUCT
NO. 400-N

BAKER OIL TOOLS, INC., / HOUSTON / LOS ANGELES / NEW YORK



186,000 BBLS. IN NEW STORAGE CAPACITY, AND—

...THE INSTALLATION OF FLOATING ROOFS PAID OFF IN JUST 6 MONTHS!

It happened at Knoxville, Tenn. That's where General American built a 6-tank terminal—including a 55,000 bbl. jet fuel pipeline storage tank—for Republic Oil Refining Company, a Division of Plymouth Oil Company.

"General American's unique experience in constructing and operating their own terminals helped us with our problems," says Holland Howell, Republic's chief engineer. "What's more, we found General American's 12-18 month payout estimate quite conservative. Through savings in filling and breathing losses alone, *the installation of floating roofs paid off in only 6 months!*"

As a result of this proved performance—speedy, dependable construction, definite savings and improved safety through use of Wiggins Floating Roofs—General American was authorized to build additional facilities for Republic. At Belton, South Carolina, tanks for the storage of 160,000 bbls. have been completed. At Doraville, Georgia, General American is now erecting a 110,000 bbl. sales terminal, and will erect another terminal at Macon, Georgia.

It pays to plan with General American

PLATE & WELDING DIVISION GENERAL AMERICAN

PLATE AND WELDING DIVISION

GENERAL AMERICAN TRANSPORTATION CORPORATION

135 South La Salle Street • Chicago 90, Illinois

Liberal Oil Law Passes Iranian Test

● New concession areas will be opening, but oil men aren't overly enthusiastic about the prospects. Biggest drawback: Uncertainty over amount of freedom

IRAN has taken the first step toward opening the entire country for oil exploration.

Iran's Majlis last week passed a new oil bill. The Senate is expected to give its approval to the new law within a week. The new legislation allows National Iranian Oil Co. to negotiate for exploration contracts outside the southwestern Iranian region which is operated by the international consortium.

The new law does not spell out final terms for an exploration contract. It merely enables N.I.O.C. to make such agreements. All contracts then must be approved by the council of ministers and the legislature. The latter only has the power to approve or disapprove. It may not change any terms.

The law excludes anybody whose own nation would not give Iranians similar rights to look for oil—in other words, Russia.

The new and revised oil legislation is far more attractive to foreign capital than the original proposals. But the way in which the law operates in practice is more important to U. S. capital than the way it looks on paper.

The new bill allows an operator to enter Iran on an independent basis as well as in a partnership deal with N.I.O.C. This is one of three ways in which an oil exploration contract can be made. The other two require partnerships with N.I.O.C.

It is extremely doubtful that any major oil company with commitments in the Middle East can afford to consider a partnership with N.I.O.C. The big question now is whether the "independent operation" provision of the law actually will be allowed to work.

Terms of the new bill are weighted in favor of a partnership deal generally. And, if Iran insists on a partnership, foreign companies may lose some enthusiasm for new exploration in the country.

On the other hand, Iran may find from a practical standpoint that an independent operation by a private company paying a bonus for an exploration contract may be far more profitable than a partnership arrangement with no bonus.

50-50 breakdown? . . . Proponents of the bill insist that the partnership provisions do not have the effect of breaking the 50-50 profit division between company and government.

Others are not so certain. It all depends on just how any contract is finally negotiated under the bill's terms.

The still unanswered question last week was whether any U. S. oil company is crude-hungry enough to make such a partnership deal with N.I.O.C.

Terms of the bill . . . The new oil bill offers three methods for a foreign company to operate in Iran. In brief they are:

. . . A full partnership with National Iranian Oil Co., the government-owned oil agency. An oil company entering into a 50-50 partnership with the Iranian company could obtain exploration rights over a maximum acreage of 8,000 sq. km. in each petroleum district in the country.

. . . A partnership in which N.I.O.C. would have less than a 50 per cent interest (but not less than 30 per cent). If the Iranian company is the minor partner, the acreage limit is less. The operator can obtain 6,500 sq. km. in each petroleum district in these cases.

. . . A completely independent operation in which N.I.O.C. has no interest. In this case the lower acreage limit also applies.

. . . Petroleum districts of not less than 75,000 sq. km. are to be formed dividing the country into application areas.

. . . One-third of the total area of Iran is to be retained as national reserve acreage.

. . . One-half of any exploratory area granted must be surrendered at the end of 10 years. The acreage turned back then becomes a part of the national reserve of Iran.

. . . Exploitation rights for a 25-year period are to be granted after a discovery. This provision of the bill calls for three possible 5-year renewals at the expiration of the original term. No exploitation rights would be granted if no discovery is made after 12 years of exploration.

. . . An operator is required to drill the first well within 4 years after the granting of exploratory rights. An operator is required to drill at least one well a year for 10 years after that initial 4-year period unless a discovery is made.

Compromise at work . . . In its final form the new oil bill is a definite compromise.

The first bill offered the Majlis special oil committee May 16 was more stringent in its terms and probably would not have been attractive to foreign oil capital. It made no provision for any operation without the Iranian Government company involved.

It also drew objections from the Majlis because it handed N.I.O.C. what some members of the parliament thought was too much power in granting the rights. The new bill provides for final governmental approval of any agreement made by N.I.O.C.

Elmer Batzell, Washington, petroleum consultant to the Iranian Government, assisted in drafting the revisions.

The new oil bill can be partly attributed to the excellent relations between N.I.O.C. and the consortium's operating committee in Iran. Much of the nationalistic suspicion with which all Iranians regarded Western oil companies has begun to evaporate.

Iran is still a political tinderbox and there are still points of friction that are hangovers from Mossadegh's abor-

Iranians Kill Plot to Blow Up Abadan

IRAN said last week it nipped a Communist plot to blow up the Abadan refinery shortly before the "zero hour" set by the saboteurs.

Deputy Premier Teimour Bakhtiar, who also heads Iran's security department, identified those arrested in connection with the plot as people working closely with Russian agents.

Bakhtiar said the plan was to explode a dynamite hand grenade in the big refinery at a strategic spot to destroy the big installation. Operated by an international consortium of oil companies, the Abadan refinery is now processing 350,000 bbl. of crude daily.

tive oil nationalization, but most of them are being worked out. The fact that the international consortium has taken Iranian oil production from practically nothing to more than 670,000 bbl. daily in past 2½ years has helped a lot. The fact that the oil operation has poured more than $298 million in taxes and royalties into Iran's treasury during that period hasn't hurt good relations any either.

Who's interested . . . Most American companies outside the consortium group, and some with a consortium interest, have eyed Iran's uncommited lands for some time.

Last week as the Majlis debated the issues of the new oil bill, interested American companies were maintaining a careful and watchful silence.

In contrast to the U. S. companies, the Italians have been making noises about Iran for months.

Enrico Mattei, head of the Italian Government-owned Ente Nazionale Idrocarburi (E.N.I.) said in Rome that he has made a preliminary deal with N.I.O.C. for a 23,000 sq. km. exploration area in three sections of Iran (OGJ, May 6, p. 94).

Reports from Japan last week indicated that the Japanese Government is lending its weight to a move to put Japanese interests in the running for an exploration deal with Iran.

Qum's future . . . The plum of Iran's territory outside the consortium area is regarded by some as the Qum area south of Teheran where N.I.O.C. made a spectacular discovery several months ago.

The Iranians, including the Shah himself, have made it clear that they intend to develop this find themselves.

The terms of the new oil bill make it possible for N.I.O.C. to develop the Qum oil find on its own or to make a deal with foreign capital, whichever it chooses. Proponents of the bill point out that the choice lies entirely with the Iranians.

Thrace Will Get Deep Test

A 10,000 to 12,000-ft. wildcat will be drilled in Thrace this fall by N. V. de Bataafasche Petroleum Mij., a subsidiary of the Royal Dutch-Shell Group.

The test will be near Babaeski, about 100 miles northwest of Istanbul in the European portion of Turkey. Contract is held by Keir & Cawder Arrow Drilling Co., Ltd., of Glasgow, Scotland, a subsidiary of Arrow Drilling Co., Tulsa.

The Tulsa firm is assembling a National 800 rig for the test. It will be shipped to Europe this fall.

Spudding due next week:

Guatemala Awaits First Test

GUATEMALA'S first wildcat will be spudded this month by Sloane Exploration Co., Houston, on the Morales concession about 35 miles southwest of Puerto Barrios.

The slim-hole rig, specially designed for overseas operation, has been shipped and probably will be unloaded this week. Sloane President Story J. Sloane, Sr., said the rig should be moved to location in time for drilling to start by July 25.

Guatemala has granted 38 concessions to date. The only drilling activity so far has been some core drilling by Standard Oil Co. of California near Livingston, close to the Santa Thomas concession in East Guatemala.

The Sloane wildcat, also in the east, will be located in the northwestern sector of the 48,000-acre Morales concession near the Honduras border.

The slim-hole Skytop rig was built by Victoria Machine & Supply Co. and is capable of reaching 7,000 ft. It was ordered through Colby, Inc., with specifications that it could be knocked down and transported in a C-54 airplane to jungle drilling sites.

Landing strips are being prepared in the concession region of Guatemala because rig transportation by air sometimes is the only practical means of getting equipment to remote locations.

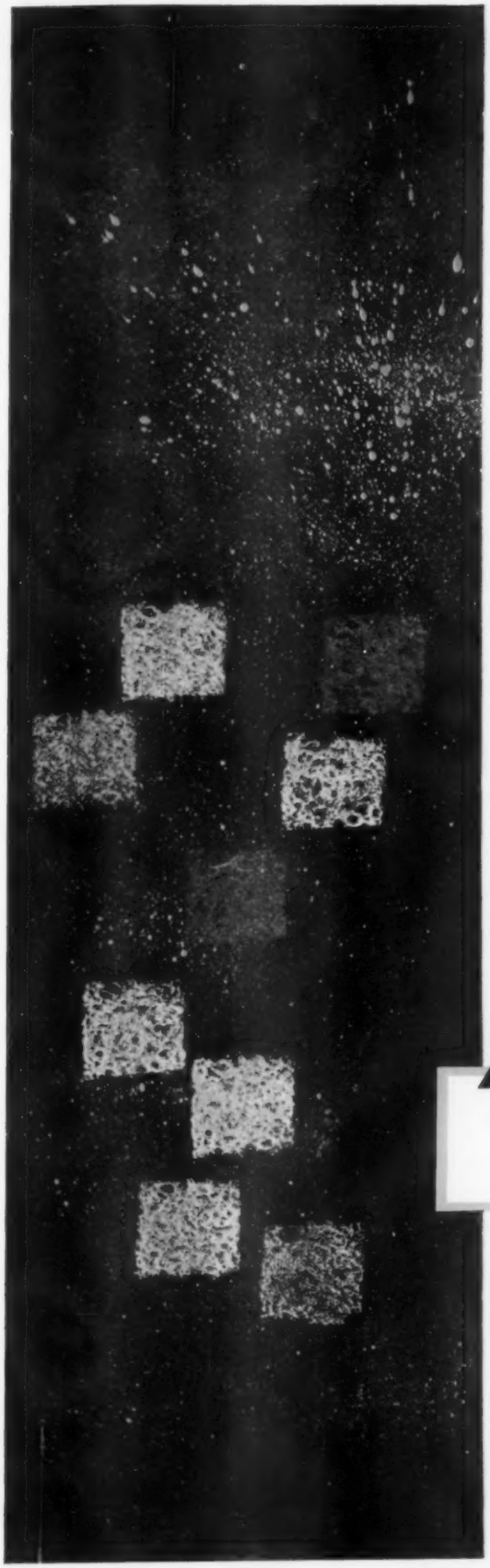
Sloane Exploration holds four concessions in the state of Izabal. In addition to Morales, it has 22,000 acres in the Santa Thomas concession near Puerto Barrios, 30,900 acres in the San Felipe concession at the northeast end of Lago de Izabal, and 23,000 acres in the El Estor concession on the southwest end of the lake.

Twelve companies own concession rights in Lago de Izabal area of eastern Guatemala.

Inversiones Guatemaltecas Americanas S. A. (Inguam), owner of a concession adjoining Sloane's on the northeast end of Lago de Izabal, plans to start operations "as quickly as possible," but no rig has been shipped and no drilling is expected this summer. Inguam is a local firm backed by Houston's David C. Bintliff Interests.

The 2-year-old Guatemalan Petroleum Code, which led to concessions on some nine million acres of land in the Central American country, gives Guatemala an eighth royalty of oil produced and 50 per cent of the profits.

Four per cent of the eighth royalty is paid to the landowner and the balance to the government. Companies are not exempt from income taxes but get a 27½ per cent depletion allowance.



DIVERSITY

a wide variety of skills...stimulated by creative thinking, tempered by solid experience...combine to produce superior results at lowest engineering and construction costs for industrial development around the globe:

BROWN & ROOT, INC.

Engineers - Constructors

POST OFFICE BOX 3, HOUSTON 1, TEXAS

No. One Wall Street, New York 5, New York

Brown & Root de Mexico, S.A. de C.V., Mexico City, Mexico

Brown & Root Construcciones, S.A., Caracas, Venezuela

Brown & Root, Ltd., Edmonton and Calgary, Alberta, Canada

Brown & Root, S.A., Panama City, Panama

Brown & Root, LTDA., Santos, São Paulo, Brazil

CABLE ADDRESS—BROWNBILT

NATURAL-GAS well flags Hassi Messaoud area where French are bending efforts to develop a major field.

DRILLING RIG and water pump team up at site 8 miles from Hassi Messaoud discovery. Pool limits are still undefined.

American Company May Enter Algeria

● Newmont Mining to bid on desert acreage; majors are cool to idea of government-controlled partnerships, but move may provide wedge for entry of smaller firms

AMERICAN mining interests have apparently opened the wedge for U.S. capital participation in the intensive search for oil in Algeria.

Up to now the French have had Algeria to themselves except for the interest the Royal Dutch-Shell Group has in two exploration companies.

But reports from Port Gentil in French Equatorial Africa indicate that Newmont Mining Corp. and the French company, Ste. des Petroles d'Afrique Equatoriale Francaise, intend to make a joint bid for acreage in Algeria's Tindouf basin along the Moroccan border.

Newmont officials in the United States declined to comment last week except to say that an announcement with regard to the venture is expected to be made in Paris any day.

The Tindouf basin is clear across Algeria from the areas being explored intensively by six companies, all except one controlled by the French Government. The basin is more than 400 miles to the west of the Hassi Messaoud region where a French company has drilled three productive wells on what is apparently a major oil structure in the Sahara Desert.

The French have made no official policy announcements with regard to outside capital participation, but there has been much speculation that U.S. oil money might not be unwelcome.

Under French oil law the searching companies in Algeria must surrender large blocks of their acreage in the near future and this is lending interest to the idea that American companies might enter the country.

It is generally conceded that any American oil company going into Algeria would do so on a 50-50 basis with a French company. That in itself is a hitch as far as some of the American majors are concerned. They are cool to the idea of having a government-controlled company as a partner.

This is not necessarily the case with some of the smaller companies who are looking for an opportunity to acquire foreign oil production.

The French effort . . . At Hassi Messaoud, the effort of the French to develop a major oil field appears almost as desperate as the government's effort to retain its grip on Algeria.

The two companies operating in that area, Ste. Nationale de Recherche et d'Exploitation des Petroles en Algerie (SN Repal) and Cie. Francaise des Petroles (Algerie), have already spent an estimated $100 million. They have completed three good wells which found production between 10,000 and 11,000 ft. and are drilling four more (OGJ, June 17, p. 120).

Some of the Algerian acreage due to be surrendered at the end of 5-year exploration licenses is in this region.

About 400 miles to the southeast at Edjele, Cie. de Recherche et d'Exploration de Petrole au Sahara (C.R.E.P.S.) has completed 10 shallow wells that produce good-quality oil in a field that is at least 19 miles long.

C.R.E.P.S. has placed an order for 16-in. pipe to build a pipeline with 100,000 bbl. daily capacity. The line will probably cross the Libyan border and terminate somewhere near Tripoli.

Libyan well spudded . . . Across the Libyan border, Esso Standard Oil Co. of Libya has spudded the first test

on its large tract in Fezzan along the Libyan-Algerian border.

The test, Haghe 1, is being drilled by Camdrill International, Inc., under contract with Esso. The site is in the southern part of the large block. The well is being drilled by a light rig moved to Libya from Sicily.

Mobil Oil Co. of Canada is putting together a rig in Houston to ship into the same general area of Fezzan for a deeper test in the autumn.

Colombia Perks Up

An-Son deals touch off new Magdalena activity

TWO NEW drilling programs have been touched off in the Magdalena Valley of Colombia. Both programs involve An-Son Petroleum Corp., Oklahoma City, which is entering the country for the first time.

An-Son Drilling Co., a subsidiary, is spudding in this week at a 7,000-ft. "obligation" well in the Lebrija area, following a deal with Mobil Oil Co. de Colombia.

For drilling the well, An-Son will get a 50 per cent interest in Mobil's 125,000-acre Lebrija concession in the Middle Magdalena Valley. An-Son will also get 100 per cent ownership of the well (an offset) and two Mobil producers which are making about 300 bbl. daily.

Mobil will take a 50 per cent working interest in all subsequent wells drilled on the big block.

Slim-hole program . . . An-Son Drilling has also signed a drilling contract with Standard Oil Co. of California, for the drilling of two development wells and eight slim-hole wildcats in the Chinu area, north of the Lebrija area.

An-Son has already started one of the two 4,000-ft. gas development wells. The eight slim-hole wildcats will go to 8,000 or 9,000 ft. and will be drilled as soon as the development wells are completed.

An-Son's two rigs will be moved up and down the Rio Magdalena by barge. One is an Ideco H-40, and the other a Cardwell-O.

Russia Pushes Electrodrill

RUSSIA will drill more than 300,000 ft. of hole this year in one of its most prolific oil provinces, Bashkiria.

By far the greatest amount of hole will be made with turbodrills, but Soviet officials say that more and more electric drills will be used in the field, "providing new opportunities for technical progress in drilling."

Although not much recent information has been let out about Russia's electric drills, the Russians have been testing two types of electrodrill. One carries the electric current through cable to the tool in the hole, and the other conducts electricity through pipe. Both are rotary, rather than percussion.

During 1956, the Russians discovered six new oil fields in Bashkiria. Two hundred new wells were put on production. Average cost of completed wells was about 1,000,000 rubles, equivalent to about $250,000 at the official rate of exchange.

Tough Drilling in Cuba

CUBA'S proposed 8,000-ft. test in Central Las Villas Province has proved more expensive than was originally planned.

As a result, C. J. Simpson, Texas independent, has sold half his 25 per cent interest in the Escambray 1 and a 24,700-acre block to Cuban Gulf Oil Co. for $50,000. This will be used to pay for further drilling.

The wildcat, which is below 4,746 ft., has been delayed by hard formation and deviation in the hole. The test has encountered serpentine and metamorphics from the time it was begun last December. There have been no shows.

The deal was put together when Consolidated Cuban Petroleum Corp. and Simpson took a farmout from Cuban Gulf. To earn a 50 per cent working interest, Simpson and Consolidated agreed to contribute one-half the expense of drilling the well.

As it stands now, Cuban Gulf owns 62½ per cent, Consolidated Cuban owns 25 per cent, and Simpson 12½ per cent.

Petrochem Complex Planned

IMPERIAL Chemical Industries, Ltd., plans to build a $280,000,000 petrochemical complex based largely on the use of crude oil and products as feed stocks.

The big British firm has asked permission of the Gloucestershire County Council to develop a 1,000-acre site on the Severn River in southwestern England. If permission is granted, development will continue into the mid-1970's.

The company has not given estimates of the amount of crude or products to be used. But the firm hopes to bring 30,000-ton tankers with raw materials directly to the site from oil fields and refineries.

Aguasay Gets Line

New 8-in. pipeline taps deep zone in Venezuela

CRUDE from Aguasay, eastern Venezuela's new deep-producing field, began moving to Puerto La Cruz last week through a new and hastily built pipeline.

The new 32 mile, 8-in. line links the field with the 16-in. Amana line which moves crude for three companies from the Santa Barbara area to the port. The new 8-in. line is wholly owned by Venezuela Petroleum Co. (Sinclair), discoverer of the new field which set off a flurry of deep drilling in western Monagas.

Sinclair, Mene Grande Oil Co., and Creole Petroleum Co. are joint owners of the larger crude trunk line.

The new pipeline has a capacity of 19,000 bbl. daily, but last week was moving only about 4,250 bbl. daily of Aguasay's initial production.

The Sinclair subsidiary's major discovery at 3 Aguasay, after only minor successes at Nos. 1 and 2 Aguasay, started a rash of deep drilling along an apparent east-west producing trend (OGJ, Oct. 29, 1956, p. 83 and Mar. 4, p. 82).

Since that time Sinclair dually completed 4 Aguasay at 13,300 ft. about 5 miles to the west of the discovery, for more than 1,600 bbl. daily. The company now has three rigs at work in the field. To the northeast of the Sinclair acreage and directly offsetting the production Venezuelan Atlantic Refining Co. and Pancoastal Petroleum Co., C.A., have two rigs developing the same pay.

First Jordan Well Spudded

THE first well to be drilled in the little Middle Eastern kingdom of Jordan was spudded last week in the Mashash area about 30 miles east of Amman, the capital city.

Jordan's youthful King Hussein was on hand to give the venture his government's blessing. The test is being drilled by Edwin W. Pauley, California independent operator, who first made a deal for exploratory rights 2 years ago (OGJ, July 11, 1955, p. 103).

The Pauley contract, approved by the Jordanian Parliament 18 months ago, gives him a 55-year concession over one-third of the country's 12 million acres. Pauley was given 8 months to select the areas he wants to test. The exact tracts covered by the concession have not been made public.

Congrats and $25 to Samuel J. Martinez, 1830 East 15th St., Tulsa 4, Oklahoma, for this quip.

Every length of Lone Star casing, tubing and line pipe is fully normalized to guarantee homogeneous grain structure throughout. Every length of pipe is quality controlled to exacting API standards . . . uniform wall thickness, perfectly round and accurate diameters.

In order to deliver more pipe to our good friend and neighbor, Joe Roughneck, the big, completely integrated Lone Star Steel plant is again being greatly enlarged. Construction of our new open hearth furnace and stretch-reducing mill is in full swing.

Neighbor, wherever you are, specify Lone Star and we both get a good deal.

Lone Star STEEL COMPANY

LSS

EXECUTIVE SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas

DISTRICT SALES OFFICES
Houston, Texas | Midland, Texas | San Antonio, Texas
Tulsa, Oklahoma | Wichita Falls, Texas | Shreveport, La.

KERR-McGEE'S second tender will work for the Phillips combine as . . .

Lake Maracaibo's Fleet Grows

ANOTHER drilling tender is heading across the water for assignment in Venezuela's Lake Maracaibo.

By September 1, Kerr-McGee Oil Industries, Inc., will begin drilling in Block 17—a 24,700-acre concession granted to a group of eight American companies in May (OGJ, May 20, p. 128).

The combine, headed by Phillips Petroleum Co. which has a 55.75 per cent interest, paid $32,357,000 for the submerged tract. Kerr-McGee has a 5.4 per cent interest. Other members of the combine are Ashland Oil & Refning Co., Sunray Mid-Continent Oil Co., Western Natural Gas Co., El Paso Natural Gas Products Co., Pacific Petroleums, Ltd., and Canadian Atlantic Oil Co., Ltd.

This will be the second Kermac tender to move to Venezuela this summer. The first was towed across the Gulf of Mexico and the Caribbean Sea last month. It will probe the lake for another American combine, which was recently awarded a concession in Venezuela.

This combine is headed by Sun Oil Co. It gained drilling rights to Block 12 in Lake Maracaibo last spring (OGJ, Apr. 8, p. 84). This block also covers 24,700 acres, or 10,000 hectares. Other companies with interest in the block include Pan American Petroleum Corp., Atlantic Refining Co., and Seaboard Oil Co.

In addition to the two tenders, Kerr-McGee will operate nine crewboats, two workboats, and a tugboat in Venezuela. The two tenders were built by Levingston Shipbuilding Co., Orange, Tex. The tug—the Senator—has already seen duty in the gulf.

This is Kerr-McGee's first move into Venezuela, although the company has operated abroad since 1949. In that year it drilled its first foreign well, which was the first test on American Independent Oil Co.'s concession in the Kuwait-Saudi Arabia Neutral Zone.

Since then, Kermac has operated in Israel, Cuba, Alaska, and along the Mexican coast.

Kerr-McGee has a lot of offshore experience. It was one of the pioneers in offshore work off the Gulf Coast.

———World briefs

California Exploration Co. has applied for an exploration license over the sedimentary area of British Guiana. The Standard Oil Co. of California subsidiary will set up and register a company in the colony with a capital of $720,000 if the license is obtained.

Lummus Co. will begin work in August on a 30,000-bbl. refinery at Whitegate, County Cork, for Irish Refining Co., Ltd. This company was set up by Esso Petroleum Co., Caltex, and Shell Mex and B. P. to build and operate the plant, which will go on stream in 1959.

Sicily's Regional Council of Mines has subdivided acreage not currently held under license into 55 blocks. The area covers about 1,300,000 acres, including the Egadi islands off the western coast. About 450,000 acres are earmarked for Ente Nazionale de Idrocarburi, the government oil agency on the Italian mainland.

Lobitos Oilfields, Ltd., has gone on stream with an 800-bbl. U.O.P. Platforming unit at its Ellesmere Port, Cheshire, England, refinery. The unit will produce an 85 to 90 R.O.N. clear product from Kuwait naphtha or a 90 to 95 R.O.N. blending component from mixed Peruvian naphthas. Procon, Ltd., of Great Britain did the work.

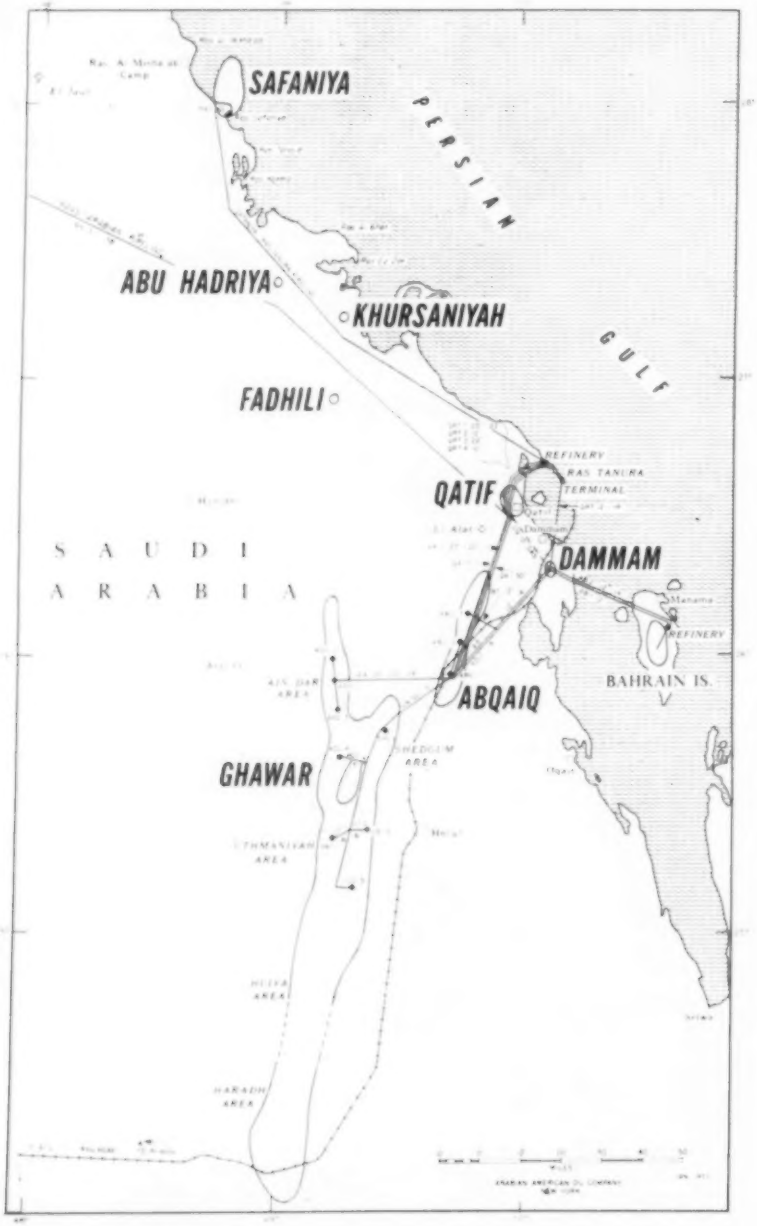
Shell Co. of Ghana has taken over the marketing operations in the new country from Shell Mex Co. of West Africa, Ltd. It is a member of the Royal Dutch-Shell Group.

Signal Oil & Gas Co. has abandoned its first test on Lot 4 in Lake Maracaibo at 9,470 ft. after encountering oil sands too close to water to justify testing. The company is moving the rig to a platform 4 miles southwest for the second test. Signal is operator for the 27,613-acre concession, owned jointly with Standard Oil Co. of Ohio, Pure Oil Co., and Hancock Oil Co.

Standard-Vacuum Oil Co. is drilling ahead at 8,500 ft. in its 1 Faire wildcat in the Cagayan Valley. In the best week to date, the well made 1,400 ft. of hole. Stanvac plans to take the test to 10,000 ft. or deeper. The company has staked a location about 9 miles from Faire for its second Philippines test.

Basic Pattern of Exploration in Saudi Arabia Remains Unchanged

Secondary recovery may mean more wells in developed fields



OIL PRODUCTION in Saudi Arabia to date is confined to the northeastern part of the country, much of it within easy pipeline distance to the Persian Gulf. Fig. 1.

Saudi Arabia's start began less than a

This article is a compilation of opinions derived from published articles by geologists of Arabian American Oil Co. Subject matter is principally confined to the producing area. Between the escarpments of Central Arabia (Fig. 2), where excellent exposures of late Paleozoic and Mesozoic rocks may be studied, and the area of oil search in Northeast Arabia, there lies a vast region in which few shallow holes and practically no deep ones have been drilled.

It is known that lithofacies changes take place within this interval. Trunction of older rocks on a regional scale is known to take place at rates of a fraction of a meter per kilometer. Some half-dozen unconformities of this regional type are known. This much general knowledge has been pieced together from widely distributed observations. Details are lacking, therefore any all-inclusive discussion of regional geology at this time would have many weaknesses and is beyond the scope of this paper.

First exploration . . . Negotiations with the Saudi Arabian Government for a concession in eastern Saudi Arabia were completed in May 1933. Methods of exploration and development of the presently productive areas are chronicled in the beginning with the first commercial production obtained from Dammam dome in March 1938. More important events occurring during this 5-year interval include the beginning of systematic field mapping in October 1933 of which the first step was the detailing of Dammam dome.

By Warren H. Thralls
and
R. C. Hasson

The spectacular growth of Saudi Arabia as an oil-producing country dominates the world oil picture. A country that had virtually no oil production in early 1940 now has oil reserves estimated at a conservative 34 billion barrels. Annual oil production has soared from 5.07 million barrels in 1940 to 361 million barrels in 1956. Here is a factual summary of the geology, physiography, exploration history, and data on Saudi Arabia's oil production. Part 2 of this article will be published next week.

as an oil nation quarter-century ago

During the 1933-34 field season, reconnaissance surveys of more than 90,000 sq. km. were completed with no other such obvious structure as Dammam being found. In 1934 and 1935 study of the coastal Miocene stratigraphy was intensified, and studies of the ground waters of the region initiated. By summer of 1935, Dammam Well 1 had been spudded, surface indications of Abqaiq and Qatif had been found, the En Nala area west of Hofuf was known to be regionally high, and El Alat had been mapped by the plane table method.

During this same 1934-35 season, surface work was carried north and west toward basement exposures and outcrop sections were measured in order to set up a stratigraphic section to guide wildcat drilling in the coastal area. Structure drilling early became an important method of exploration.

The first contract seismograph party arrived in Arabia in the early part of 1937. By this time most of the rock units were recognized and named by the late Max Steineke (formerly chief geologist, Aramco, and Sidney Powers Memorial medalist, 1951) in unpublished writings.

The year 1938 was a decisive one in company operations. Ten wells on Dammam dome had been bottomed in the Middle Cretaceous productive zone of nearby Bahrain Island with disappointing results. Damman Well 7, drilled to explore lower horizons, found oil in commercial quantities in the late Upper Jurassic Arab formation in March 1938.

PART 1 OF 2 PARTS

STRUCTURE DRILLING was introduced in the Qatif-El Alat area (Fig. 1) of eastern Saudi Arabia in the fall of 1936 and the seismograph at Abu Hadriya in the spring of 1937. With the advent of gravity work at Dammam dome early in March 1939, the list of major methods of exploration was almost complete. Many refinements have been made in the intervening years, but the basic pattern of exploration remains unchanged.

The postwar years have seen the addition of the magnetometer to the gravity parties, and photogeology has been used to advantage on older rocks. Offshore structure drilling and seismic surveys have been carried out in the Persian Gulf. Slim holes for stratigraphic information have been drilled as deep as 5,000 ft. with light, portable rigs.

Surface structure . . . Dammam is a surface structure with abundant outcrops and was mapped with plane table before the first hole was drilled. Surface indications of structure at Abu Hadriya led to a seismic survey which resulted in the location of the discovery well, completed in March 1940. This preceded by 8 months the opening of Abqaiq as a producing field.

Definition of Abqaiq was by structure drill. Unsuccessful wildcats were drilled at Ma'aqala (1940) and at Al Jauf (1944) during the war years. In June 1945 Qatif was discovered. This, like Abqaiq, was an area in which surface indications suggested structure but which necessitated the structure drill to confirm and define. Production, which had averaged a little less than 15,000 bbl. per day during the years 1940 through 1943, increased fourfold in 1945.

Postwar . . . Following the war, exploration was intensified and is still continuing. As early as 1941 a few widely spaced structure holes had confirmed surface evidence of much of En Nala anticline. Additional structure drilling in 1947 and 1948 revealed favorable closures along the trend, and wildcat locations were staked at 'Ain Dar and Haradh (Fig. 3). Oil in commercial quantities was discovered at 'Ain Dar in June 1948 and at Haradh in February 1949.

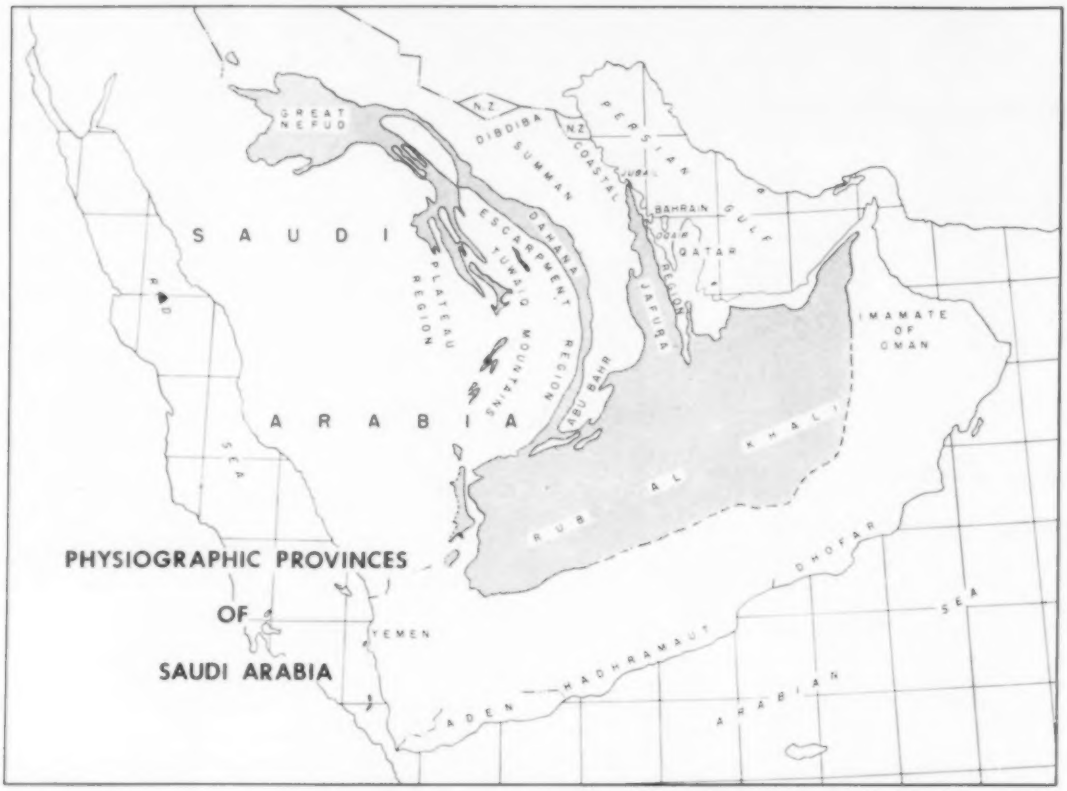
Fadhili, a structure-drill prospect located more than 100 km. north of the discovery well at 'Ain Dar, was discovered the same month as Haradh. Gravimetric coverage of the 'Ain Dar area had been completed prior to staking the first location. By the end of the 1950-51 season, the coverage had been extended to the south to include Haradh. Semidetailed structure drilling was carried on in the 'Uthmaniyah area during the fall of 1948 and in the Huiya area during the spring of 1951. The discovery well at 'Uthmaniyah was completed in April 1951.

Following 'Uthmaniyah, the Shedgum area was opened in August 1952. This was another discovery by structure drill. Seismic methods had been found impracticable over all the central and southern portions of Ghawar, probably due to the presence of limestones at and near the surface. Seismograph is, however, credited jointly with structure drill in the discovery of Safaniya in August 1951.

Safaniya Well 1 was Aramco's first offshore discovery. Juiya Well 1, on the En Nala trend south of 'Uthmaniyah, was found productive in December 1953. And with the completion, 5 months later, of Haradh Well 8, all doubts were removed as to the continuous productivity of En Nala from 'Ain Dar to Haradh, a distance of about 225 km.

During the 1956-57 field season, Aramco maintained four seismic parties, three structure-drill parties, and one gravity-magnetic party in the field.

Deep drilling . . . Although credit has been assigned here to different methods of exploration for the discovery



SAUDI ARABIA is divided into six physiographic provinces. The plateau region is composed of crystalline basement rocks. Fig. 2.

of the various fields of Saudi Arabia, it must be emphasized that delineation of deep structure has been accomplished, for the most part, by deep drilling. Methods employed to evaluate Ghawar, for example, called for a minimum of wells sufficient to deplete the field at maximum efficient rates and, at the same time, to obtain adequate reservoir information for production planning.

Initial stepouts in 'Ain Dar were 5½ km. along the crest with profiles across the structure at intervals of every 11 km. Offset wells on the profiles were spaced at intervals of from 1,800 to 2,750 m. By the end of 1950, 14 wells were completed in north 'Ain Dar; an area 28 km. long and 8 km. wide was proved productive; and the structure was still open to the south.

Drilling continued in Haradh and seven wells had been completed in an area 24 km. long and 16 km. wide without having delimited the structure. When 'Uthmaniyah Well 1 proved productive, the first exploratory stepout was 16 km. north followed by one 13 km. west of the stepout. As drilling continued, the Shedgum area appeared to be a part of the same structure. Following completion of the initial Shedgum well, distances between exploratory stepouts were greatly increased.

Thirteen wells were used in outlining and developing the Shedgum area which is approximately 32 km. long and 11 km. wide. A well 26 km. south from 'Uthmaniyah resulted in proving Huiya productive, and a well the same distance north from Haradh furnished enough structural control and reservoir information to connect all five areas as a single reservoir.

Abqaiq exploration . . . Ten wells along the major and minor axes comprised the exploratory drilling at Abqaiq. Primary development was by two series of ring wells, one on the 6,000-ft. subsea contour and the other on the 6,500-ft. subsea contour. In North Abqaiq, drilling followed a more or less block system of spacing with offset wells about 3 km. apart. Development at Dammam dome followed a 200-500-acre pattern with no two wells closer than 450 m. Exploratory wells at Qatif have been drilled along the major axis and along central and northern transverse profiles.

Secondary methods of recovery and pressure maintenance may necessitate more wells in presently developed fields. A secondary phase of development is now beginning at Abqaiq

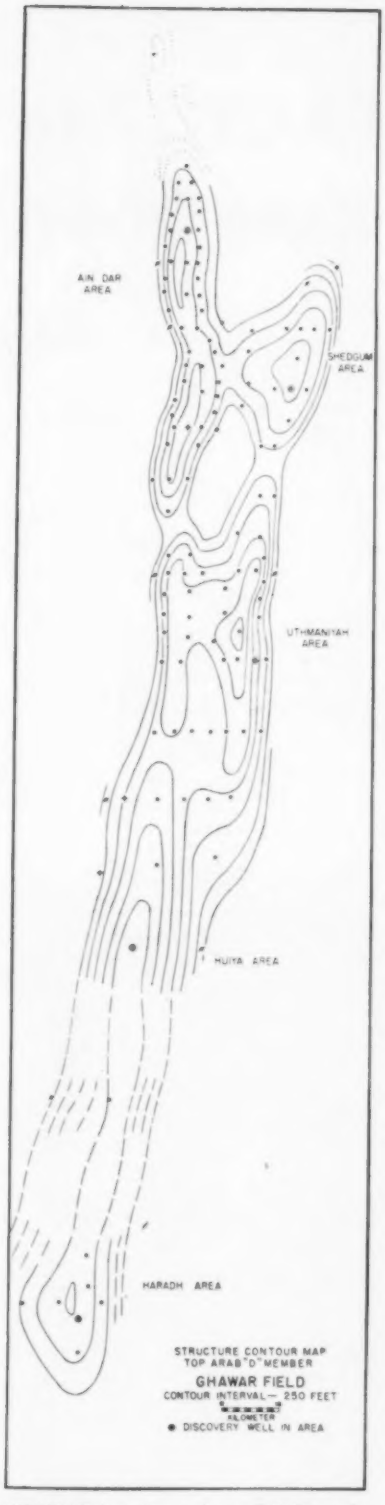
THE AUTHORS

W. H. THRALLS

R. C. HASSON

Warren H. (Jake) Thralls is supervisor of exploration for Arabian American Oil Co. He attended University of Kansas and Colorado School of Mines and was graduated from Stanford University in 1921 with an A.B. degree. Thereafter he saw service with subsidiaries of Standard Oil Co. (New Jersey) and The Texas Co. in Argentina, Colombia, Ecuador, Bolivia, Trinidad, Mexico, Canada, and various sections of the United States. Since joining Aramco in 1947, Thralls has spent 6 years in Saudi Arabia, where he served as geologist in charge of structure drill operations, and 4 years in Aramco's New York office.

R. C. Hasson was graduated from Texas Technological College in 1949 with a B.S. degree in petroleum geology and received his M.S. degree there the following year. After 12 months with Seismograph Service Corp., he went to Saudi Arabia in 1951 as an Aramco geologist. In 1955 he was transferred to Aramco's New York office, where he is continuing his stratigraphic studies and working toward a doctorate at Columbia University.



GHAWAR is a tremendous oil field, probably the largest in the world, extending a distance of 245 km. The axis probably extends northward to Safaniya (see Fig. 1). Fig. 3.

where 150 M.c.f. of gas per day is returned to reservoir and a pilot water-injection program has been initiated.

Did you know . . .

- Aramco's daily average crude production in 1956 was 986,129 bbl.?
- Proved reserves in Aramco's concession are estimated at 34 billion barrels?
- A 142-mile pipeline is under way to transport offshore Safaniya's oil?

Physiographic Provinces

The boundaries of the six physiographic provinces (Fig. 2) follow quite closely the outcrop pattern of Saudi Arabian geology.

Central Plateau . . . The Central Plateau is an outcrop area of Precambrian crystalline basement rocks of the ancient stable mass of the African-Arabian shield. Elevations range from 800 to 1,800 m.

West facing escarpments . . . East of the Central Plateau region and in a great arc around it is a series of west facing escarpments, some with as much as 500 m. relief, with long dip slopes to the east. The scarps are outcrops of predominantly Mesozoic rocks separated from the Central Plateau by a relatively narrow band of Paleozoic (Cambrian to Devonian, Permian.)

The arc is some 1,500 km. in length and 320 km. wide extending from the south end of the Tuwaiq Mountains to the Great Nefud on the north. The topographically low area between the Tuwaiq Mountain scarp and the Central Plateau region to the west contains some of the larger nefuds (sand areas) of Arabia.

Dahana . . . East of the escarpment region is a great sand strip of 25 to 75 kw. wide extending from the Rub' al Khali on the south to the Great Nefud on the north, a distance of 1,500 km. The sand follows Eocene outcrop to Lat. 27° N where it turns westward to join the Great Nefud.

In the north, the sands are generally stabilized with limestone and dikaka (hummocky sand with sparse covering of small bushes and bunch grass) surfaces common. In the south, there are bands of active sand on each side of the Dahana in which moving dunes are common. Average elevation is 450 m.

Summan Plateau . . . The Summan is a dissected limestone plateau of Miocene-Pliocene rocks varying in width from 80 to 250 km. The plateau grades north into a vast, almost featureless gravel plain, the Dibdiba, and south into another gravel plain, the Abu Bahr, which in turn loses its identity under the sands of the Rub' al Khali.

The eastern margin of the Summan is a sinuous line of east facing scarps. Average elevation is approximately 250 m.

Persian Gulf Coastal region . . . Southward from the border of the Kuwait-Saudi Arabia Neutral Zone the terrain is more or less stabilized low rolling sand ridges covered with dikaka inland and sabkhas (salt flats) near the coastline. In the vicinity of Jubail and southward is a 30 to 120-km.-wide belt of active sand dunes resting on salt flats.

South of Oqair to the base of the Qatar Peninsula is an east-facing escarpment. Between this escarpment and the Summan on the west a sand belt, the Jafura, extends from Jubail south to merge into the Rub' al Khali. Excepting small Eocene exposures at Dammam and Abqaiq, outcrops are Miocene-Pliocene in age. Highest elevations in the coastal region are seldom over 100 m.

The shore line of the Persian Gulf is irregular with many sand spits. Shoals and occasional small coral reefs are common in shallow water which extends for a considerable distance into the gulf.

Great sand areas . . . The two great sand areas of Saudi Arabi are the Great Nefud and the Rub' al Khali. The Great Nefud covers an area of approximately 145,000 sq. km. in the northwestern part of the country. Along the western and southern margins, dunes are very high and almost conical in shape.

The Rub' al Khali, one of the largest continental sand bodies in the world, covers an area approximately 1,200 km. long and 650 km. wide. The central and western portions consist of regions of large undulations of rolling sand with occasional areas of dune sand.

The eastern portion contains far more dune sand, the dunes becoming larger and more abundant eastward into the sand-mountain area. The "sand mountains" are great dune ridges up to 20 km. in length and 300 m. in height. **End of Part 1.**

How to use the

ABSORPTION FACTOR to Keep Lean-Oil Rate Down

By W. T. Lanz

HERE IS a simple but effective method of controlling the absorption process. Supervisors who have an absorber in their unit will be interested because its use will give optimum product recovery at minimum absorption oil circulation. Engineers, too, could estimate quickly an oil rate for a new design, economic study, etc.

The basic concept in this method is the absorption factor. Since A. Kremser[1] introduced the absorption factor to the N.G.A.A., it has become the engineer's most valuable tool in setting up the design of an absorber.

Worthy contributions by Souders and Brown,[2] and Horton and Franklin[3] have developed its use for this purpose. A later article by R. Maass[4] simplified these original derivations to where they could be used by plant operators.

This method is derived from the findings of these men.

"Method provides maximum product recovery at economic operating conditions. Absorption of undesirables is held to a minimum."

Absorption factor . . . In the absorption process an accurate prediction of each component's yields can be made from the expression:

$$\text{Fraction absorbed} = \frac{A^{n+1} - A}{A^{n+1} - 1} \quad (1)$$

where:

n = the number of theoretical contacts between gas and absorption oil

A = effective absorption factor of each component

N.G.S.M.A.'s Engineering Data Book[5] contains a plot which solves this equation. Since n may be considered constant for any one absorber, the individual component recovery is a function of A only.

What is A? By definition it stands for the term (L/VK)

where:

L = total moles of liquid leaving a theoretical contact

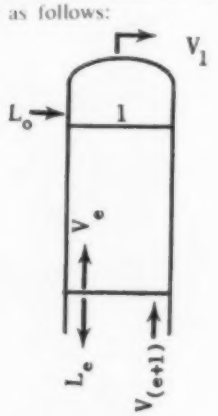
V = total moles of vapor leaving the same contact

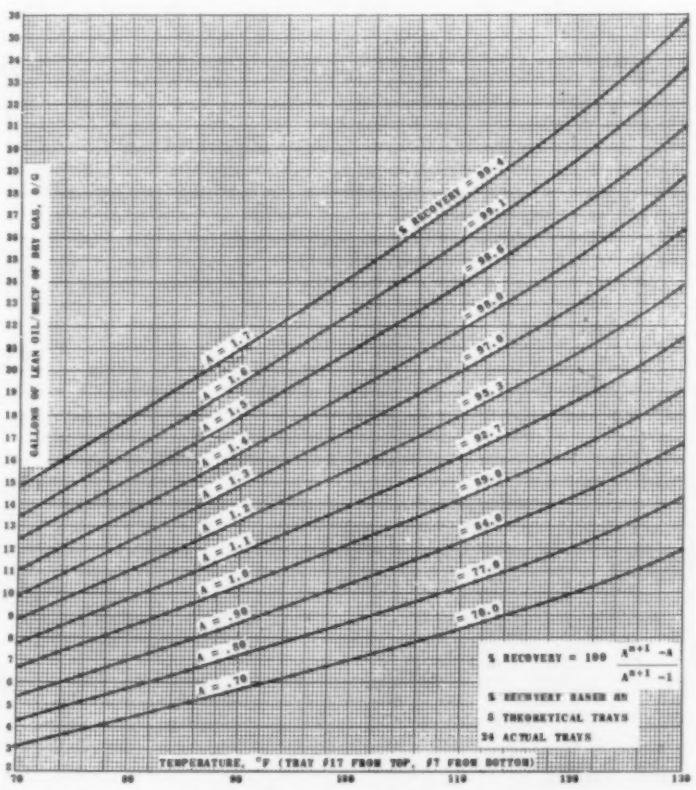
K = equilibrium constant y/x at pressure and temperature of contact

y = mole fraction of a component in the vapor

x = mole fraction of same component in the liquid

It is related to lean oil rate in a manner as follows:





GALLONS of lean oil per thousand standard cubic feet of dry gas using isobutane absorption factors with a dry-to-wet-gas ratio of 0.90. (Pressure 450 psig.) Fig. 1.

V_1 = moles of dry gas
L_o = moles of lean oil
L_e = total moles of liquid from tray e
V_e = total moles of vapor from tray e
$V_{(e+1)}$ = total moles of vapor from tray below e
e = theoretical tray which exhibits most effectively the average conditions throughout the tower. Top tray is No. 1

By material balance

$$L_o = V_1 + L_e - V_{(e+1)} \quad (2)$$

By definition

$$A = L_e/V_eK_e \quad (3)$$

$$L_e = A V_eK_e \quad (4)$$

where:

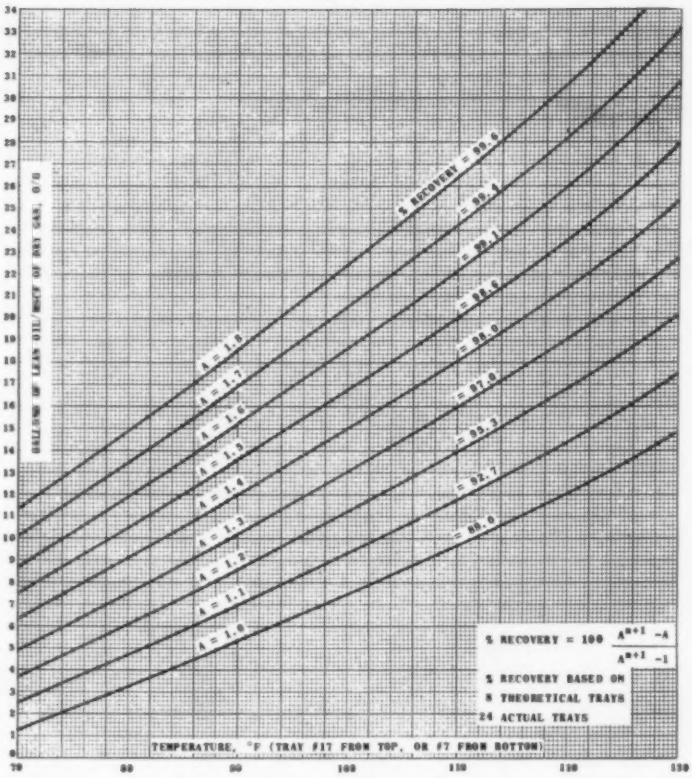
K_e = equilibrium constant of each component at pressure and temperature of tray e
A = absorption factor of component corresponding to K_e

By assuming equal absorption, the fractional reduction in vapor at each tray is

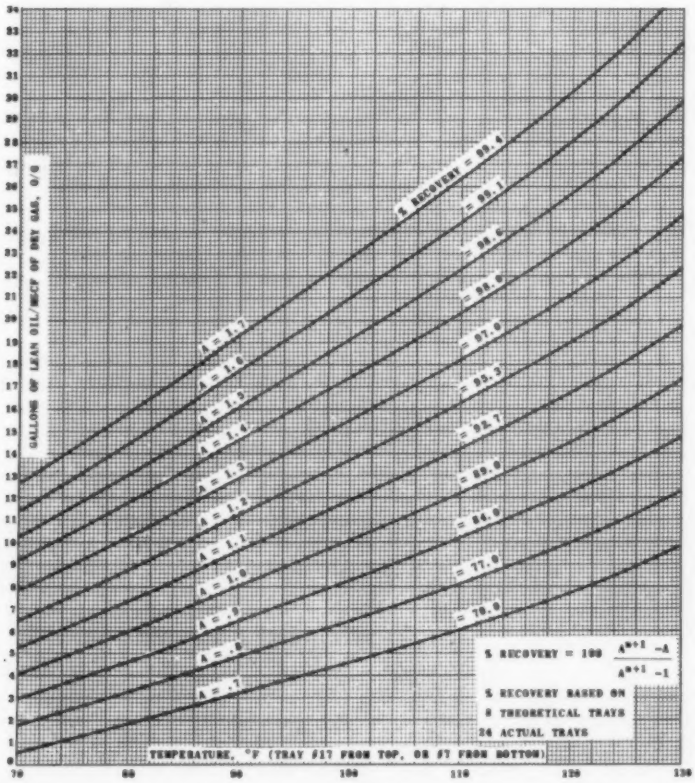
$$(V_1/V_o)^{1/n} = V_e/V_{(e+1)} \quad (5)$$

where:

V_1 = moles of dry gas



GALLONS of lean oil per thousand standard cubic feet of dry gas using isobutane absorption factors with a dry-to-wet-gas ratio of 0.80. (Pressure 450 psig.) Fig. 3.



GALLONS of lean oil per thousand standard cubic feet of dry gas using isobutane absorption factors with a dry-to-wet-gas ratio of 0.85. (Pressure 250 psig.) Fig. 2.

V_o = moles of wet gas
n = number of theoretical contacts

The total reduction at tray e is

$$V_e/V_o = (V_1/V_o)^{(n+1-e)/n} \quad (6)$$

$$V_e = V_o (V_1/V_o)^{(n+1-e)/n}$$

For tray (e+1)

$$V_{(e+1)} = V_o (V_1/V_o)^{(n-e)/n} \quad (7)$$

Substituting (4) (6) (7) in Equation 2,

$$L_o = V_1 + A K_e V_o \times (V_1/V_o)^{(n+1-e)/n} - V_o (V_1/V_o)^{(n-e)/n} \quad (8)$$

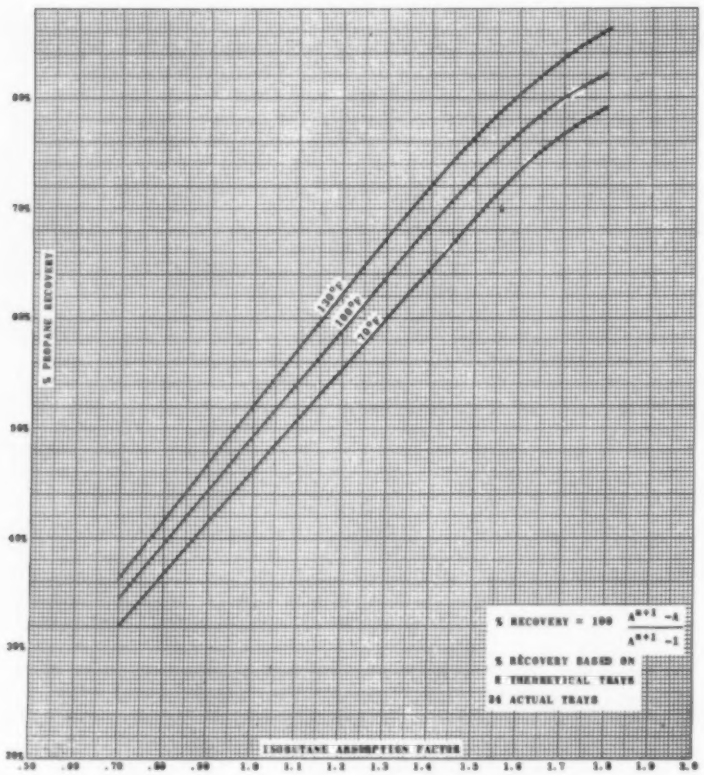
Dividing by V_1

$$(L_o/V_1) = 1 + A K_e (V_o/V_1) \times (V_1/V_o)^{(n+1-e)/n} - (V_o/V_1) (V_1/V_o)^{(n-e)/n} \quad (9)$$

Simplifying,

$$(L_o/V_1) = 1 + A K_e (V_1/V_o)^{(1-e)/n} - (V_1/V_o)^{(-e/n)} \quad (10)$$

$$(L_o/V_1) = 1 + (V_1/V_o)^{(-e/n)} \times [A K_e (V_1/V_o)^{(1/n)} - 1]$$



PER CENT PROPANE RECOVERY as a function of isobutane absorption factor and temperature. (Temperature measured at tray 17 from top, or 7 from bottom. Pressure 450 psig.) Fig. 4.

$$(L_o/V_1) = 1 + \left[\frac{AK_e(V_1/V_o)^{(1/n)} - 1}{(V_1/V_o)^{e/n}}\right] \quad (11)$$

$$L_o = (8.33 \times sg \times O)/M \quad (12)$$

$$V_1 = G/0.379 \quad (13)$$

where:

sg = specific gravity (H_2O=1.0)
M = molecular weight of lean oil
O = gallons per day, lean oil
G = M.s.c.f. per day, dry gas

Dividing (12) by (13)

$$L_o/V_1 = (3.16 \times sg \times O/G)/M \quad (14)$$

Equating (11) with (14)

$$O/G = (M/3.16\,sg) \times \left[1 + \frac{AK_e(V_1/V_o)^{1/n} - 1}{(V_1/V_o)^{e/n}}\right] \quad (15)$$

O/G ratio . . . From here on O/G will be referred to as the oil to gas ratio and means gallons of lean oil per M.s.c.f. of dry gas.

Analyzing the above expression shows O/G is dependent upon the following:

1. Physical properties of lean oil, including molecular weight and specific gravity.
2. Average absorber pressure and temperature for determining K.
3. Absorption factor.
4. Wet-gas shrinkage.
5. Number of theoretical trays, n.
6. Location of effective tray, e.

In most plants many of these terms are constant. These are: molecular weight and specific gravity of lean oil, obtained by thorough stripping; pressure, by controlling to within very close limits; theoretical plates, by multiplying the number of actual trays by tray efficiency. Under these conditions the O/G ratio becomes a function of the temperature, the absorption factor, and the dry-wet gas ratio. Let us see how these variables can be evaluated in the field.

The average column temperature is readily approximated by the arithmetic mean of the temperature on the top and bottom trays. If not obtainable, the dry-gas and rich-oil temperatures may be used. Where a more accurate method is needed, for special cases such as intercooled absorbers, plotting the readings from a multipoint indicator should give an accurate temperature. A simple procedure is to measure the temperature on the tray which most nearly exhibits the average column conditions. This tray is located from temperature profiles made from column studies. Table 1[3] by Horton and Franklin locates the effective tray as a function of the key component absorption factor.

TABLE 1—LOCATION OF EFFECTIVE TRAY
(Plates numbered from top to bottom)

A of key component	e/n
0.0-0.1	1.0
0.1-0.4	.9
0.4-1.0	.8
1.0-4.0	.7
4.0 and up	.6

Other factors . . . Two factors, the key component and its desired recovery, set the absorption factor. The key component is the one most difficult to extract. In most cases today, isobutane is this component. However, propane is gradually assuming the lead role. Absorption factors for the remaining constituents are inversely proportional to their equilibrium constants. Plant superintendents specify the absorption factor as calculated by Equation 1.

The dry-wet gas ratio is determined by metering both streams. In case the wet gas is not metered it can be estimated by adding the product streams to the dry gas.

Since the above values are easily determined by the operator, controlling the lean oil merely boils down to solving Equation 15 for the O/G ratio. Because of the complexity of this computation, a simpler and more efficient procedure is to draw a set of curves correlating O/G ratio with the three variables, temperature, A factor, and dry-wet gas ratio. Here is how such a set may be drawn.

Typical Plant Calculations

Suppose for illustrative purposes that we are looking at an absorber in a typical gasoline plant.

Absorber

Operating pressure, 450 psig.
Number of trays, 24.

THE AUTHOR

W. T. Lanz is a process engineer with Fluor Corp., Ltd., in Los Angeles. He joined the company 5 years ago. His work has been primarily in petroleum refining, including process design and instrumentation. Lanz graduated from California Institute of Technology in 1949 as an applied chemist and spent 2½ years with Richfield Oil's natural-gas division in Bakersfield. He is registered in California as a professional engineer.

Lean-oil characteristics

Molecular weight = 180

Specific gravity = 0.845 (60° F.).

Assuming 33⅓ per cent plate efficiency, n = 8.

Key component is taken as isobutane.

From Table 1, e/n = 0.70 for A factor from 1.0 and 4.0.

$$O/G = 180/(3.16 \times 0.845) \times \left[1 + \frac{AK(V_1/V_o)^{0.125} - 1}{(V_1/V_o)^{0.7}}\right]$$

$$= 67.5\left[1 + \frac{AK(V_1/V_o)^{0.125} - 1}{(V_1/V_o)^{0.7}}\right]$$

From past experience it has been found that the wet gas shrinkage lies between the limits 10 to 20 per cent. Therefore we will draw three sets of charts, one each for 0.80, 0.85, and 0.90 dry to wet gas ratios.

For 0.80 the equation reduces to $O/G = 76.6(AK - 0.148)$

For 0.85 $O/G = 74.2(AK - 0.110)$

For 0.90 $O/G = 70.6(AK - 0.0732)$

See accompanying Figs. 1, 2, and 3 for the graphical solution to the equation. Fig. 4 is an added feature showing propane recovery as a function of average absorption temperature and isobutane factor.

A similar set of curves could be drawn for any type of plant and component. Fig. 4 is based on the fact that absorption factors of the other constituents are inversely proportional to their equilibrium constants.

Example 1 . . . Plant A has an absorber operating at the same conditions as the previous example. The plant manager from past studies concludes that the optimum recovery under present conditions is an isobutane factor of 1.3. The operator, having been so informed, measures the temperature at tray 17 from the top as 115° F. The dry gas rate is 40 M.M.s.c.f.d.; wet gas 47 M.M.s.c.f.d. The dry to wet gas is 0.85. From Fig. 2, O/G ratio is 19.7. Lean oil rate required:

$$G.p.m. = (19.7 \times 40 \times 10^3)/1{,}440$$

$$= 547; \text{ say } 550$$

(1,440 = minutes per day)

Example 2 . . . Plant B has two absorbers operating at the same conditions as Example 1. One absorber handles high-pressure wellhead gas; the other, compressor discharge. Lean oil comes from a common source. Operation is held at a 1.3 isobutane factor. A summary of the calculation is as follows:

	Absorber 1	Absorber 2
Temp., tray 17, °F.	120	112
Wet gas, M.M.s.c.f.d.	27.0	20.0
Dry gas, M.M.s.c.f.d.	22.0	18.0
Dry to wet-gas ratio	0.815	0.900
O/G ratio	*19.8	20.6
Lean-oil rate, g.p.m.	300	260

*Extrapolated between Figs. 2 and 3.

If the maximum lean oil available is less than 560 g.p.m., continued calculations at lower isobutane factors are required in order to get the most efficient split.

The success of this program depends upon correcting the calculated absorption factors with empirically proved values. This can be done by comparing the recovery expected from computations with that actually received. Adjustments so made will compensate for assumptions made in the derivation of Equation 15.

Advantages . . . Controlling the lean-oil rate by an absorption-factor method is of great value in operating a plant. Primarily and most important of all is maximum product recovery at economic operating conditions. Absorption of undesirables is held to a minimum. In case of a single lean-oil source, more efficient splitting can be obtained with parallel absorbers.

In using this method, operators will develop a better understanding of the absorption process.

Acknowledgment

I wish to thank D. E. McDonald, of Richfield Oil Corp., for giving me the idea presented here. Without his assistance this article would not have been written. Also appreciation is expressed to the Fluor Corp. Technical Publications Committee, and Fluor employes, A. J. Ebersole and P. Shroff, for their helpful comments.

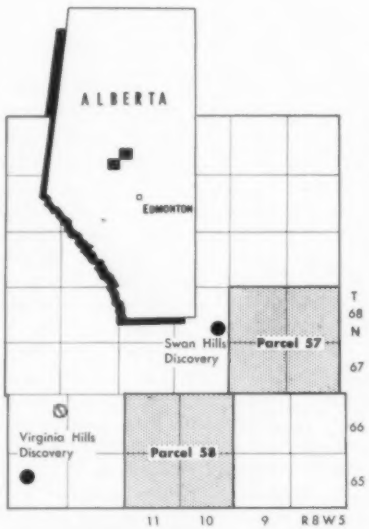
References

1. Kremser, A., National Petroleum News, 22, No. 21 (May 21, 1930).
2. Souders, Matt, Jr., and Brown, Ind. Eng. Chem., 24, No. 5, 519 (1932).
3. Horton, George, and Franklin, W. B., Ind. Eng. Chem., 32, 1384 (1940).
4. Maass, Randal, Calif. Oil World and Petroleum Industry, Second Issue, 23, (Nov. 1943).
5. Brown, G. G., N.G.S.M.A. Engineering Data Book, 1951 addition, pp. 134-135.

Canadian Hot Spots on Block

EDMONTON.—Two big parcels in Western Canada's hottest exploration grounds this year will go up for lease July 23.

They include 184,320 acres in the Virginia Hills area and are flanked by two big discoveries, one in Virginia Hills and the other in the Swan Hills.



Virginia Hills-Swan Hills acreage is included in Alberta sale.

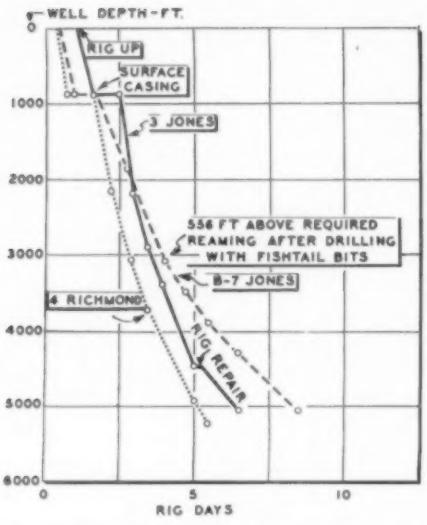
The parcels are part of 205,063 acres to be offered at Alberta's third Crown Reserve sale of 1957. Other lands in the sale are 9,903 acres at Pembina, two quarter sections at Glen Park and Joffre, and five parcels covering 1,278 acres at Keystone-Cardium. Of the total, 193,242 acres are attractive wildcat lands and 11,821 acres are field acreage.

One of the Virginia Hills offerings, Parcel 57, offsets the lease where Home Oil Co., Ltd., recently brought in an important Slave Point-Devonian discovery. The other, Parcel 58, is offset to the west by the Virginia Hills block where Home made another Slave Point-Devonian strike.

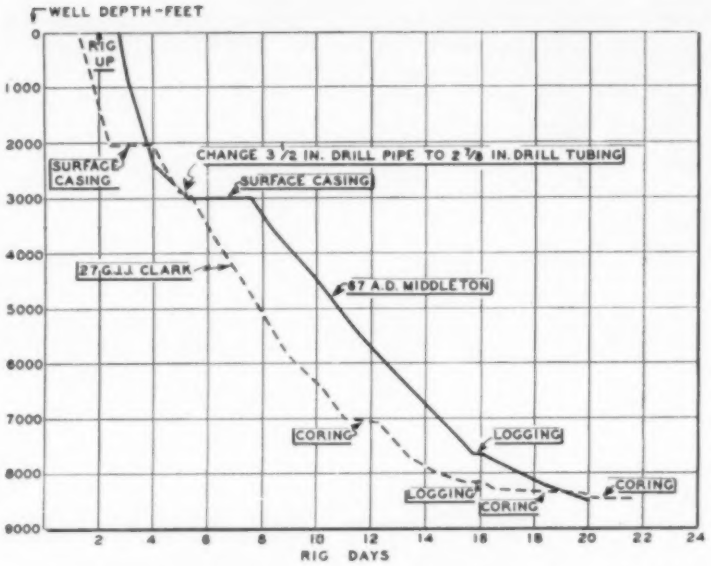
At this same sale, Trinidad Leaseholds, Ltd., paid $287,252 for a block just west of Parcel 57. It was on this block that Home made its Swan Hills discovery. Home got one-half interest in the well on a farmout deal.

Home's Virginia Hills strike was on a farmout from Hudson's Bay Oil & Gas Co., Ltd., and Union Oil Co., which paid $935,600 for the lease where the well was drilled. Home received one-third interest in this one.

Another block at the 1954 sale went to Shell Oil Co. for $1,843,500. Shell's lease is just west of the Trinidad Leaseholds' block.



COMPARATIVE drilling time to total depth for 3 J. H. Jones, a 7⅞-in. hole, and B-7 J. H. Jones and 4 Fred Richmond, small holes, Imogene district, Southwest Texas division. Fig. 1.



COMPARATIVE DRILLING TIME, 67 A. D. Middleton, an 8⅝-in. hole, and 27 G. J. J. Clark, a 6⅛-in. hole, in Anahuac district, Gulf Coast division. Fig. 2.

Cost of well cut 14 per cent as . . .

Small Holes Pay Off for Humble

Improved rock bits have been used to advantage in the small holes and it is felt that with bits now available, hole size can be further reduced

By G. E. Cannon and R. A. Watson

REDUCING size of casing and other equipment required to produce an oil well has proved to be a practical means of reducing well costs both for exploratory and developmental drilling. As of 1957, a total of 304 wells have been drilled in a program of using smaller hole and casing sizes. Depths have ranged from 1,225 to 10,824 ft. The wells consisted of 241 producing oil or gas wells, 44 dry holes, and 19 water-flood wells. Production-casing size varied from 3½ to 5-in. o.d. pipe.

Costs of wells drilled in the program average 14 per cent less than costs of regular-size wells. Savings result from the use of smaller rigs and material.

Results of this program show:

- Drilling time for wells of reduced diameter in most instances has been comparable to that for regular-size wells.

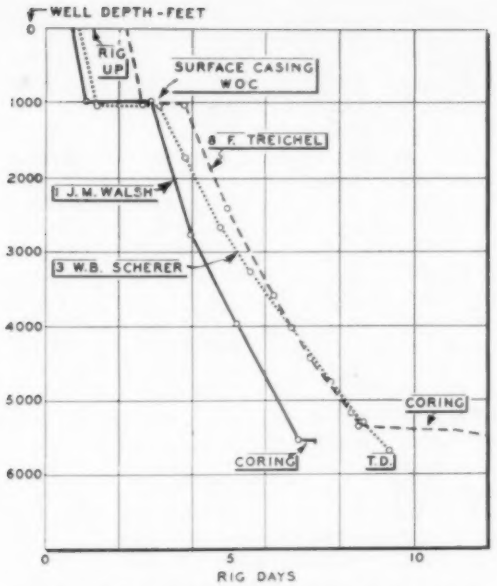
Authors are with Humble Oil & Refining Co., Houston. Paper presented at meeting of North Texas Oil and Gas Association, Wichita, Falls, Tex.

- Of prime importance is adequate mud-pump horsepower at circulating pressures greater than usually associated with mud drilling. This is necessitated by higher friction losses in drill pipe of reduced diameter.
- Use of portable rigs powered for handling small pipe reduces equipment and labor charges. Four and three-men crews are being used on rigs used in drilling wells of reduced diameter.
- Small-hole techniques are quite adaptable for use with air or gas drilling. There is a reduction in air or gas volume requirements while at the same time performance of small bits is improved.
- Newly developed rigs, bits, pumps, drill-tubing joints, coring and logging equipment, perforating guns, packers, wellheads, etc. have made drilling and completing wells of reduced diameters successful.
- Well bores having 4-in. or less diameter with corresponding reduction in casing o.d. are now within the realms of possibility.

Reasons for program . . . High drilling costs due to increasing material and rig operating expenses coupled with greater well depths has caused a search for means of counteracting cost increases. Admirable results have been attained in reduction of drilling time by improved methods and equipment. Further reductions in costs have appeared possible by reducing hole size sufficiently to allow use of smaller rigs and well equipment in relatively deep drilling.

A program of using reduced hole and casing sizes has in later years seemed more likely to meet with success than when initially tried in the late 1930's. Reasons are: Advent of mud pumps capable of operating at the pressures required by high pressure losses in small holes and drill pipe, improvements in the control of mud properties, and development of well-completion techniques applicable to smaller casing sizes.

Consequently, Humble reconsidered such a program in the early 1950's which at the outset consisted of a



COMPARATIVE drilling time to coring depth, 1 J. M. Walsh, 8 F. Treichel, and 3 W. B. Scherer, 8⅝-, 6⅛-, and 4¾-in. holes, in Tomball district, Gulf Coast division. Fig. 3.

study of previous and current operations prior to the decision to drill. Limited drilling at this time by other operators was confined to exploratory tests with no intention of setting small-diameter production casing. Should a producing zone be found, either the small hole would be reamed or an adjacent regular-size well drilled to accommodate accepted standard-diameter casing.

Since it was evident that maximum reduction in well cost would be effected by drilling and completing wells using reduced casing sizes and lighter equipment, Humble's program was set up to include drilling wells in producing areas as well as for exploratory drilling.

Application

Humble's first well as a result of the current study was drilled and completed as a producer in Danbury field, Texas, starting in October 1953. A 4¾-in. hole was drilled to 5,800 ft. below 8⅝-in. surface casing set at 1,375 ft. The drill string consisted of 2⅞-in. o.d. N-80 upset tubing and 3¾-in. o.d. drill collars in the 4¾-in. hole. The tubing was fitted with tool joints. A jackknife power rig was used.

Drilling rate was relatively slow due to limited bit weight carried and inadequate bits available at that time in the 4¾-in. size. The low bit weight was due to concern over hole deviation, which actually proved a minor problem. Unsuccessful experimentation was carried on with various types of bits other than three-cone rock bits used for most of the drilling.

Total hours rotated were 318 compared with 200 for an adjacent 7⅝-in. well. The 4¾-in. hole was induction logged and sidewall cores were taken. At 5,711 ft., 4-in. o.d. flush-joint casing was cemented with rather high circulating pressures due to the small annular clearance.

The well was completed as a flowing oil well in 29.7 days compared with 20.9 days for a large-size well. Despite the longer drilling and completing time and experimentation expense, total cost for the 4¾-in. well was slightly less than for a regular 7⅝-in. well with 5½-in. oil string.

Next wells better . . . A second adjacent well, a 5⅝-in. hole, was immediately drilled and completed with a 4-in. o.d. threaded and coupled casing in 26.5 days with the same rig at a cost of 15 per cent less than for a regular size well. In addition to a reduction in tool-rental charges, casing cost was less, and improved performance was obtained from bits which were available in the 5⅝-in. size.

In view of these encouraging results, 15,000 ft. of 2⅞-in. N-80 drill tubing was purchased equipped with welded-on tool joints. It was to be used in drilling 6⅛-in. or smaller holes.

The next wells were drilled under the program in Pruitt field, Southwest Texas, beginning in March 1954. Well depth was slightly greater than 5,000 ft. The first two were 5⅝-in. holes drilled below 7-in. surface casing while subsequent wells were 6⅛-in. holes drilled below similar surface pipe. A total of 23 such wells were drilled in the area during 1954, and 69 were drilled, including 6 dry holes as of the end of 1956.

A saving of 13 per cent per well was indicated in well cost compared with 7⅞-in. wells with 5½-in. oil strings. Comparative drilling-time curves for two wells having reduced hole and casing sizes and one regular size well at Pruitt are shown in Fig. 1.

Rates match large holes . . . Drilling rates were increased, as indicated by curves for the second and seventh wells drilled, when it was found possible to carry weights of from 14,000 to 15,000 lb. on the small bits with rotary speed over 130 r.p.m. As much as 13,000 lb. was carried on 6⅛-in. fishtail bits without detriment to the 2⅞-in. E.U.E. N-80 drill tubing.

Actual penetration rates became quite comparable to those for regular holes. Four-inch and 4½-in. o.d. threaded and coupled casing was set in the 5⅝-in. and 6⅛-in. holes, respectively, as oil strings. A small rig has been used in drilling these wells.

The practice of using smaller casing and a reduced hole size was begun in other Texas areas, and by the end of 1954 a total of 40 wells had been drilled by contract rigs, most of which were jackknife or trailer rigs. A total estimated savings of 13 per cent was effected in these wells compared with large holes.

For one 10,260-ft. well deepened from 6,384 ft. on a reduced hole size and casing program basis, a saving of 39 per cent was indicated due in part to reduced size of protective casing and elimination of hole reaming.

Revision of hole size and casing programs has shown continued expansion with resultant savings in well costs keeping pace. The number of wells drilled of this category and total savings have more than doubled from year to year; and the 187 wells drilled in 1956 represent 20.6 per cent of the total wells drilled by Humble during the year with a 15 per cent savings.

Hole sizes used . . . The hole size considered in this analysis ranges up to 6¾-in. Areas where it has been the practice in the past to drill the 6¾-in. holes on a routine basis are not considered. Production casing up to 5-in. o.d. has been used. Wells have been drilled deeper than 10,500 ft. One well was completed as a dual oil well with 5-in. o.d. casing set at 10,599 ft. after drilling 6¾-in. hole to 10,647 ft. For the 6¾-in. holes 3½-in. or 4-in. drill pipe has been used.

The 6¾-in. hole size has proved particularly adaptable for use with medium-size rigs which are often called up to drill deeper than their normal rating. Rig equipment can be used with a minimum of alteration. Hoisting speed is increased by substituting 4-in. for 5-in. o.d. drill pipe and penetration rates are increased by application of the available hydraulic horsepower to a smaller bottom-hole area.

As an example, a 6¾-in. well drilled to 9,485 ft. in the Texas Gulf Coast area in 1955 by a medium steam rig required 4.4 fewer drilling days than an 8⅝-in. offset well drilled to

8,714 ft. by the same rig. To have drilled the 8⅝-in. hole to 9,485 ft. would have required an estimated 9.4 drilling days more than the 21.1 days for the 6¾-in. hole, and well cost would have been 17 per cent greater.

Deep well, light rig . . . One of the deepest wells of the category mentioned, drilled with a light portable rig was a 6⅛-in. hole drilled to 8,489 ft. at Anahuac in the Texas Gulf Coast in 1956. The light portable rig had a 103-ft., 150,000-lb.-capacity mast and 380 maximum horsepower on the draw works. The well was completed as an oil well with 4½-in. casing set at total depth.

Fig. 2 shows comparative drilling time between the 6⅛-in. hole and an 8⅝-in. adjacent hole drilled by a heavy steam rig. The curves indicate that the light rig rigged up in half the time for the heavy rig and that drilling time was comparable. The 6⅛-in. hole was drilled using 2⅞-in. N-80 drill tubing weighing 6.8 lb. per foot. Due to the lower rig-operating and casing costs the well was drilled and completed for a 12 per cent reduction.

New type bits . . . Another interesting well was a 4¾-in. hole drilled at Tomball, a Texas Coastal field, utilizing newly designed soft-formation three-cone rock bits. Previously, although rock bits had been made available in the 4¾-in. size, the style for drilling soft shale was not in production.

The well was drilled to 5,700 ft. total depth by a light jacknife contract rig. Five and one-half-inch surface casing was set at 1,040 ft. Two and seven-eighths-inch N-80 drill tubing was used together with 3¾-in. drill collars.

Performance of the 4¾-in. soft-formation bits indicated improvement over previous designs of that size. Nozzle sizes used were ¼-in.

The well was drilled and completed without complication in 13.7 days. It is felt that faster penetration rates and more footage per bit could have been obtained had maximum bit weight not been limited to 8,000 pounds. Length of the drill-collar string was held to 300 ft. because of fear of losing returns in a 3,400-ft. zone due to back pressure on the formation caused by close clearance.

A 6⅛-in. offset well drilled with 16 per cent greater bit weight per inch showed a 21 per cent faster penetration rate. Seven bits were used in drilling 4,640 ft. of 4¾-in. hole against five bits for drilling 4,300 ft. of hole in the 6⅛-in. well. No hole-deviation trouble was experienced.

Fig. 3 shows comparative drilling time for the 4¾-in. well and 6⅛-in. and 8⅝-in. wells drilled in the field. Although 2 days more were required in drilling the 4¾-in. hole, total well cost with 3½-in. casing was 8.2 per cent less than for a 6⅛-in. well with 4½-in. casing or 34.6 per cent less than for an 8⅝-in. well with 5½-in. casing.

Small-hole completion . . . At total depth electric and MicroLogs were run, and six sidewall cores were taken in the 4¾-in. hole. A three-core sampler was run twice to obtain the 6 cores. In this way, the samples hung below the tool body when coming out of the hole providing additional clearance. A 3½-in. o.d. oil string was set at 5,668 ft. with 80 ft. of 5-in. o.d. casing on top for kelly clearance, and a stage-cementing tool at 2,551 ft. Five centralizers were run on the 3½-in. pipe.

After drilling out the stage tool plugs with a 2¾-in. mill on 1.9-in. o.d. tubing, gamma-ray and neutron logs were obtained. The tubing was rerun and set at 5,266 ft. with a joint of 2-in. E.U.E. tubing on top to connect to the 2-in. christmas tree. A 1⅜-in. o.d. swing-jet gun was run through the tubing and the 3½-in. casing perforated with 29 shots from 5,572 to 5,578 ft. for production. The well was completed as a flowing well.

In the North Texas area during 1955 and 1956, a total of 54 wells have been drilled by Humble of 6¾-in. size, 4½-in. casing being set when producing wells were made. Depths ranged from 1,835 to 7,700 ft. Although rigs were used that in most cases would have drilled larger holes, a saving in well costs was effected by a reduction in expenditures for casing and cement.

Improved rock bits have been used to advantage in the small holes and it is felt that with bits now available, hole size can further be reduced with gains in penetration rates due to application of available pump horsepower to drilling the smaller-diameter hole. The 3½-in-o.d. drill pipe and 4¾-in. drill collars now often used with 6¾-in. hole could also be used in drilling 6⅛-in. wells.

Bit Performance and Design

Progress in drilling small holes has been aided by improvements in rock bits in 6¾-in. and smaller sizes. These include bit construction and longer cutter teeth for soft drilling. Bearing design has also been improved especially in the 4¾-in. range. Good runs with small diamond bits in Southwest Texas made their use appear promising for relatively hard, deep drilling.

Concerning nozzle diameters, both 13/32 and ⅜-in. nozzles have been used to advantage in 6¾-in. and 6⅛-in. bits. In certain areas, rock-bit failures have resulted while drilling shallow sections due to sand erosion of the bit bodies and insert snap rings. Experience indicates that complete erosion failures are likely to occur in these bits at pumping rates greater than 250 g.p.m. Failures can be reduced by the use of ⅜-in. or smaller bit nozzles and reduced circulating rates under erosive conditions. Drilling efficiency is to a great extent maintained by the increased nozzle velocity.

Drill-Tubing Selection

Two and seven-eighths-inch N-80 tubing equipped with 3⅞-in. or 4⅛-in. o.d. welded-on tool joints has been very satisfactory in drilling 6⅛-in. holes to depths as great as 7,350 ft. A 5,500-ft. string of this pipe drilled over 150,000 ft. of hole. The tool joints are hard banded.

Although this pipe has been used in drilling shallow 6¼-in. holes, hydraulics indicate that 3½-in. drill tubing with 4⅝-in. tool joints should be used so as to reduce pressure losses in drilling 6¾-in. holes of any depth and 6⅛-in. holes below medium depth. Smaller hole sizes of 5⅝-in. or 4¼-in. would make efficient use of the 2⅞-in. tubing with welded-on tool joints in deeper drilling. High-yield-strength tubing should be quite adaptable for drilling.

Drill-Collar Application

It is now general practice in Texas Gulf Coast areas to use 4¾-in. and 5¼-in. drill collars, respectively, in 6⅛-in. and 6¾-in. holes. In East Texas, 5¼-in. drill collars have successfully been used in 6¼ and 6⅛-in holes, while in North Texas where 6¾-in. holes have been drilled, drill-collar diameters have ranged up to 6 in.

Indications are that the use of 4¾-in. drill collars in a 6¾-in. hole will result in a greater tendency for the hole to deviate than if 5¼-in. collars were used. Drilling rate will be reduced if bit weight is decreased to control deviation.

Full-gage replaceable blade stabilizers have been used in conjunction with 4¾-in. drill collars in drilling 6⅛-in. wells in the Gulf Coast division to aid in controllng angle. Similar stabilizers, slightly under gage, have been used with 5¼-in. drill collars in 6¾-in. hole.

Oil-emulsion mud has been used in most of the wells in which small-

diameter casing has been employed, and in addition to increased penetration rates, there's less danger of hole trouble and sticking pipe.

For drilling in the 6¾-in. to 5⅝-in. range, sufficient mud pump capacity should be available to circulate 250 g.p.m. at 1,600 psi. at least. Minimum available pump horsepower should be 300.

In order to avoid severely overloading gears in 14-in. stroke pumps while operating at high pressure, the pump should run at maximum rated speed so as to allow use of smaller liners to attain the desired circulating rate. For drilling 4¾-in. holes 125 g.p.m. pump capacity should be a minimum at 1,400 psi. with 150 hp. available. Drilling efficiency could be greatly improved if small mud pumps were available to operate at 2,000 psi. or more for drilling holes of small diameter.

Formation Evaluation

Drill-stem testing, logging, and coring have given no unusual difficulty. Although conventional coring has been used to a great extent, recently a wire line assembly with soft-formation head was used in conjunction with 2⅞-in. drill tubing. It cored 398 ft. in a 6⅛-in. Texas Gulf Coast well with an average recovery of 82 per cent.

Casing and Tubing Sizes Employed

No difficulty has been experienced in running 4½-in. threaded and coupled (T.&C.) casing in 6⅛-in. holes and 5-in. T.&C. casing in 6¾-in. holes as oil strings. Both centralizers and scratchers are generally used on both sizes of casing to insure good cement jobs. Formation fracturing on completion has been successful in many wells.

In wells where no sand trouble is expected, standard 2⅜-in. E.U.E.. T.&C tubing has been run inside 4½-in. casing. In wells which may give sanding trouble, 2⅜-in. nonupset T.&C. tubing has been run. It is expected that a newly designed integral tubing joint combining A.P.I. threads with an outside diameter smaller than that of an A.P.I. coupling will soon be available. This will be stronger than the nonupset A.P.I. T.&C. joint.

Another means of providing added annular clearance in 4½-in. cased wells prone to give sand trouble would be to run 1½-in. nominal, 1.9-in o.d. E.U.E. tubing in place of 2⅜-in. tubing. The A.P.I. coupling o.d. of this pipe is 2.5 in. Use of 1.9-in. tubing would also allow setting of 4-in. or 3½-in. casing, respectively, in 5⅝-in. or 4¾-in. wells where washovers are not anticipated. Producing capacity of 1.9-in. tubing will be adequate for many wells. Logging, gun perforating, and artificial-lift equipment are available for use in this size pipe as are retrievable gas-lift valves.

Air and Gas Drilling

The drilling of hole sizes to accommodate small-diameter casing is quite suitable for air or gas drilling. One well in the North Texas area which had been previously drilled with gas was deepened from 6,300 ft. to 7,579 ft. using gas to drill a 4¾-in. hole.

As hole diameters are reduced, the air or gas requirements to maintain a 3,000-ft. per minute free-air velocity in the annulus are also reduced appreciably. For example, drilling at 6,000 ft., air or gas would be needed at a rate of 350 cu. ft. per minute in a 6¼-in. hole with 3½-in. drill pipe, compared with 1,090 cu. ft. per minute for 8¾-in. hole with 5-in. drill pipe. **End.**

Refiners are told . . .

How to Reduce Explosion Hazards

By Larry Resen
District Editor

INCREASING USE of light hydrocarbons in the petroleum industry has led to vessel explosions; oxygen in process systems has led to detonating shock waves following ignition; and high structures have introduced a "chimney" effect during windstorms.

Proper precautions can do much to alleviate the potentialities of these hazards, George Armistead, Jr., Washington consultant, told participants at the twelfth annual short course in gas technology held at Texas A. & I. College, Kingsville. The course is sponsored by the Southern Gas Association.

What to do . . . For the industry man faced with the problem of keeping his equipment running—the only time it's paying off—here are some tips from Armistead:

In storing liquefied petroleum gases, keep the shells cooled off during a plant fire. Heat on the bottom of a half-filled tank won't have much effect, since the boiling liquids within will keep this part of the shell cool. But the top dry half of the shell will quickly fail during a fire. Insulation helps, but built-in sprays which can be turned on during a fire are the solution.

The horizontal tanks tend to move lengthwise when they explode. The tendency is for an end to blow out and the tank to move axially. When you locate them, don't "aim" them at critical process equipment.

Watch those processes carefully where oxygen enters the system. In certain types of equipment, mainly tubular vessels and piping, a detonating shock wave builds up on ignition. The flame front travels rapidly and builds up a shock wave ahead of it. Little is known about shock waves, except that they do tremendous damage and are capable of shattering large vessels.

Pipelines should not be purged with air, nor should air be used to displace liquid or gases in closed systems. Rather, use an inert gas even though it's a bit expensive. Oxygen entering some propane tanks was ignited through an entering line and shattered 6-in.-thick vessels used at one particular location.

Chimney effect . . . Windstorms can cause serious damage in plants primarily due to chimney effects. Elevator shafts on large cat crackers, for instance, should always be enclosed to prevent the shaft from acting as a flue. Where lines enter a vessel, such as the steam coils in some cat cracker regenerators, considerable care has to be exercised to insure airtight fittings. Otherwise, incoming air can raise internal temperatures beyond control.

Sulfur poisoning can crop up as more and more hydrogen sulfide is handled. A vessel containing iron sulfide, can act as a generator if acid should leak into it accidentally.

Jet fuel storage can be hazardous. Kerosine, the prime jet-fuel component, is relatively nonvolatile, but the vapors have concentrations of hydrocarbons in the flammable range. Hence, carbon dioxide blankets and floating-roof tanks have to enter the picture.

BURYING THE PIPE is the only practical way of protecting it against the dangers of the river. The trench should have a smooth bottom and few bends. Mississippi River bank trench is being backfilled here near Bayou Sara, Louisiana. Fig. 6.

There's a lot of engineering involved in

Getting a Pipeline Across a River

By Leo M. Odom

Part 2 of Three Parts

IN THE DESIGN of a pipeline river crossing the engineer must consider several factors: the effects of buoyancy, stream currents, stream turbulence, scour and fill of the stream bed, bank recession, debris and sand movement, temperature changes, anchoring of boats, dredging, corrosion, corrasion, and attack by marine organisms.

Of these factors the characteristics of the external dynamic loads, i.e., those caused by currents and turbulence, are probably the least understood and are also the most frequent cause of trouble. Pipeline crossings of rivers, whether submerged or aerial, present basically the problem of a cylinder submerged in a moving fluid.

Both aerial and submarine crossings are thus subject to several similar dynamic loads derived from the movement of the surrounding fluid. These loads differ in their magnitude and relative importance as the density and possible velocity of the surrounding fluid, i.e., air or water.

Perhaps the most readily conceived of these loads is drag, or the downstream force resulting from impingement of the current, or wind, on the pipe.

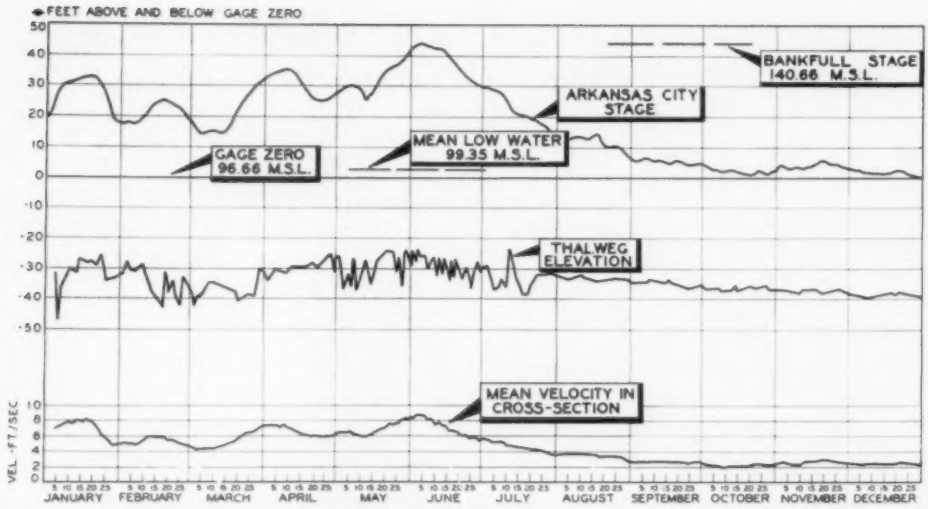
The second dynamic load is a periodic alternating load acting perpendicular to the primary direction of the current which tends to induce vibration or "flutter" of the pipe. This type of load occurs only at certain combinations of stream velocity and pipe diameter. It is a result of the "circulation" about the pipe and may be examined and evaluated through the relation exposed by the von Karman vortex trail.

A third load resulting from the dynamic effects of the moving fluid is that resulting from the "turbulent velocity fluctuations" of the passing flow. Less is known of the details of this phenomenon than of the two foregoing load sources. Briefly, it results from the fact that in turbulent flow the instantaneous downstream velocity at a point varies widely with time; that is, there are irregular velocity pulsations.

These velocity pulsations result in a variation of total pressure at the point; and the variation in pressure between adjacent points, or between a relatively still or constant velocity fluid, such as that permeating the bed, and a point within the moving fluid, results in loads acting toward the relatively low pressure point.

Drag . . . The "drag" or downstream force acting on a submerged pipe may be readily estimated by means of well-established experimental drag coefficients once the pipe size and design velocity of the fluid are established. A horizontal downstream force or drag of 25 lb. per linear foot of smooth 30-in. pipe is produced in water at a current velocity of about 5.5 ft. per second; and a force of 75

Author is with Pyburn & Odom, consulting engineers, Baton Rouge, La. Paper presented at A.S.C.E. meeting, Jackson, Miss.


FEET ABOVE AND BELOW GAGE ZERO
BANKFULL STAGE 140.66 M.S.L.
ARKANSAS CITY STAGE
MEAN LOW WATER 99.35 M.S.L.
GAGE ZERO 96.66 M.S.L.
THALWEG ELEVATION
MEAN VELOCITY IN CROSS-SECTION
VEL. - FT./SEC.
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

A STABLE CROSS-SECTION of the Mississippi may be in danger of becoming unstable because of changes occurring above and below the site. This is Chicot Landing about 7 miles above Arkansas City, Ark. Fig. 7.

lb. per foot of pipe is produced at a velocity of about 9 ft. per second.

The drag per linear foot of 30-in. pipe suspended in a 100-m.p.h. wind would be approximately 25 lb. per linear foot.

The horizontal wind-load effects on pipeline bridges are resisted by the wind cables. On submarine lines, it is desirable to avoid such loading either by adequate entrenchment or, in some instances where small lines are involved, the provision of weight sufficient to hold the line in position on the bottom and minimize exposure.

The most critical condition of drag-force loading on submerged lines usually occurs during the laying or pulling operation. The possible magnitude of the drag load requires that during the construction of submerged lines full advantage be taken of the natural low-velocity periods. The line exposed during laying must be provided with adequate support.

Vibratory or flutter loading . . . The periodic loads resulting from "circulation" about a cylindrical object result in the most spectacular, as well as one of the most dangerous, load conditions encountered in suspended pipelines.

Circulation is induced about a cylinder by the formation of vortexes in its wake. These vortexes, at certain Reynold's numbers, form and then break away on alternate sides of the cylinder's wake. The characteristic wake developed by vortexs spaced regularly and alternately behind the cylinder is called the "von Karman vortex trail."

On a rigid cylinder the period of vortex formation and shedding, and thus the period of force reversals, is dependent on the velocity of the flow. If the cylinder is free to vibrate, the proportionality between stream velocity and vortex shedding is obscured by a tendency toward the development of vortexes in phase with the natural frequency of the cylinder and its supporting structure. The most severe vibration and oscillation occurs under this combination of forced vibration resulting from vortex formation and "self-excited" vibration at the natural period of the suspended cylinder.

Examples of the deflection and stress conditions that may be expected as the result of such loading are afforded by the observed oscillation of pipeline suspension bridges, the "singing" of telegraph wires, and the "flutter" of pipes suspended in water.

Remedial action for the prevention of such oscillations includes such measures as increasing the stiffness of the structure and thus changing its natural period, the installation of damping devices, or, in some instances, the alteration of the structure profile by the installation of shrouds or similar devices. With submerged pipelines, the best solution is again adequate cover with the hope that the most critical conditions will occur during laying.

Turbulence loading . . . Loads resulting from turbulent velocity fluctuations are irregular, and are generally obscured by the previously discussed more readily analyzed loads. They are of particular significance during the initial stages of submarine pipeline exposure, as the line is uncovered by scour. Their possible magnitude requires that they be considered.

Present knowledge does not permit an estimate of the area over which such pressure differences may exist. It is of interest to note in this connection, however, that such pressure variations have been held responsible for "lifting" articulated concrete mat revetments.

Design against pressure variations resulting from turbulence is generally adequately provided for by the measures outlined above for resistance to drag and flutter forces.

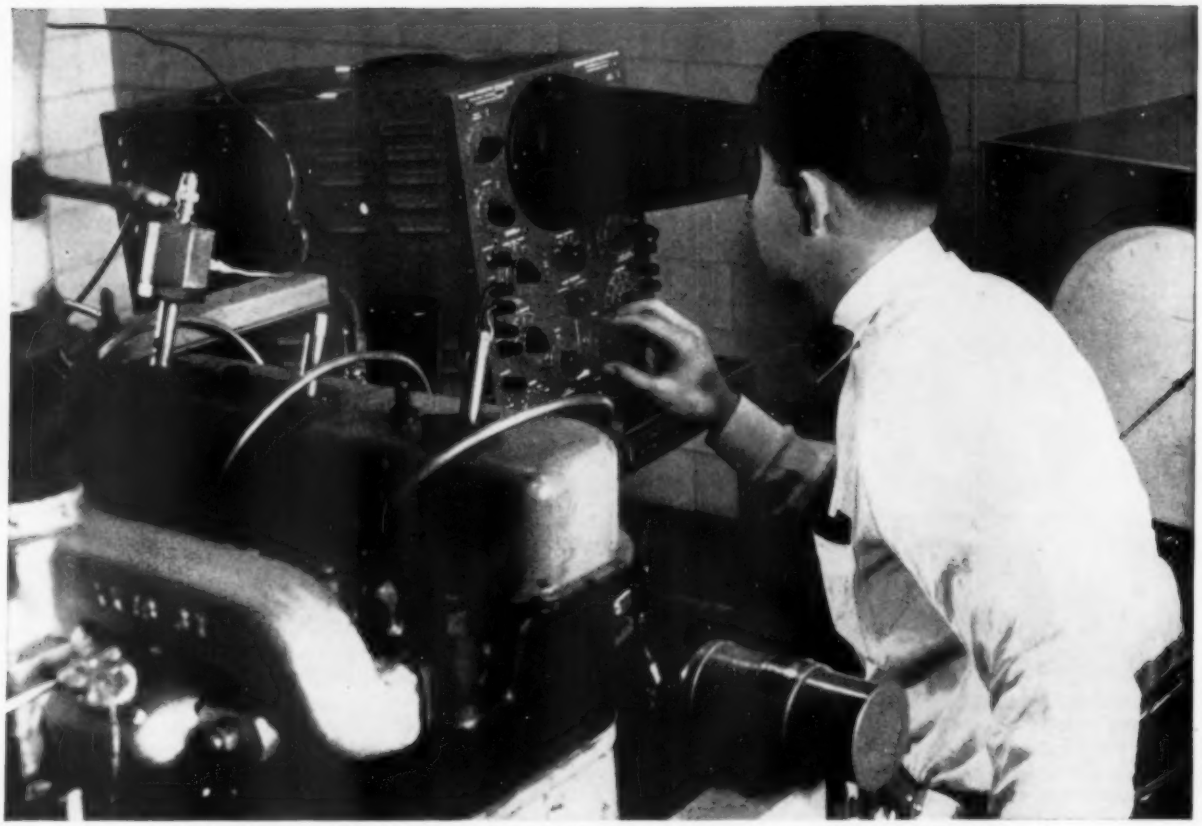
The only practical method of protecting a large line against most of the dangers referred to above lies in entrenchment into the bed and banks of the river. For streams flowing in channels composed of hard rock a trench is blasted across the stream deep enough to permit covering the pipe.

This trench should have a smooth bottom and be laid out so that the pipe can be fitted to it with as few bends as practicable.

Alluvial streams . . . Entrenchment in alluvial rivers requires a great deal more consideration. Bank and bed changes are constantly occurring in such streams to more or less extent. In order to insure an underwater pipeline against damage from currents, dragging anchors, corrosion, etc., the pipe must be entrenched into the bed and banks sufficiently that bank movement will not disturb it nor scour uncover it during the economic life of the project.

The accomplishment of this objective may be limited in some cases by the availability of capable equipment although hydraulic dredges with digging depths of as much as 100 ft. are in service. The decision as to the entrenchment into the bottom is based on a study of the available cross-sections and thalweg profiles and a consideration of cyclic variation in the elevation of the bed which varies with stage.

In the most stable reaches of an alluvial river neglect of this last factor has been known to result in failure of a pipeline. There are very few locations where the amount of this variation has been accurately measured. A graph showing the variation in the elevation of the thalweg during a period of 1 year plotted against gage heights at an otherwise stable cross-section on the Mississippi River is shown on Fig. 7.



This Ethyl engineer matches crank angle time with the cylinder pressure pattern on a dual beam oscilloscope.

Ethyl Research Measures True Engine Friction

Unique instrumentation used to study the advantages of high-compression engines and their octane requirements

by R. E. Gish

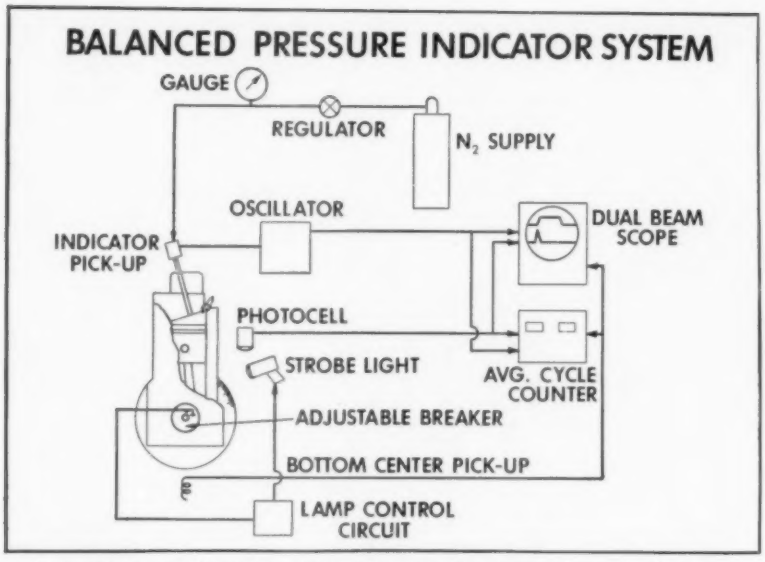
Technical Service Division, Ethyl Corporation Research Laboratories

TWO NEW DEVICES for measuring friction in an automobile engine during operation have been developed by Ethyl Corporation's Research Laboratories to improve the accuracy of studies of high-compression engine behavior.

These studies are being conducted as part of a continuing effort to preserve a reasonable relationship between the advantages of high-compression engines and their octane requirements.

The unique instruments make obsolete a method of approximating power-robbing friction losses by measuring the amount of power required to drive a non-firing engine.

This approximation does not take into account the effects of combustion pressures and temperatures which are present only during actual operation. Using the new instruments together, true engine friction can be determined accurately.



A schematic drawing of the electronic measuring system for measuring true engine friction.

Mechanical Efficiency Maintained as Thermal Efficiency Increases

Differences between true and motoring friction were studied in a four cylinder, overhead valve engine at compression ratios of 7.0 to 1 and 12.0 to 1. This engine was selected because attractive gains in power and fuel economy had been obtained with increased compression ratios in a previous test program. These results offered ample evidence of the engine's structural rigidity.

Test results verified that motoring friction does not provide a firm guide to true engine friction; motoring friction was both significantly higher and lower than true friction in the various tests.

Variations in peak cylinder pressure are averaged as the engine runs on this "average cycle counter."

This research program also showed that, although friction increased with compression ratio, the mechanical efficiency of the engine during full-throttle operation was only 1.5% lower at the 12 to 1 compression ratio than at 7 to 1.

Thus, it appears that mechanical efficiency can be maintained almost constant as thermal efficiency increases throughout this compression ratio range.

It was shown, in addition, that certain worthwhile improvements in brake horsepower can be obtained from relatively small increases in mechanical efficiency.

Equally significant, the limiting ratio for improvements in brake horsepower and fuel economy appears to be well above the 12 to 1 ratio as the curve of brake thermal efficiency versus compression ratio shows no sign of leveling off at 12 to 1.

Electronic System Includes New Pressure Measuring Equipment

One of the new instruments is a specially-designed, balanced pressure indicator that compares cylinder pressure with a known reference pressure. The second new device is an "average pressure" computer which averages the cycle-to-cycle variations in pressure in the peak pressure region and establishes the corresponding crank angles.

Both are also used in conjunction with a dual beam oscilloscope and associated electronic equipment to obtain a visual indication of the relation between cylinder pressure and crank angle.

The data obtained permit accurate plotting of the pressure-volume relationships in an operating engine.

Thus, indicated horsepower can be determined directly. Since brake horsepower is measured simultaneously, friction horsepower can be determined by subtraction. (Indicated Horsepower – Brake Horsepower = Friction Horsepower.)

This study is typical of the many ways in which Ethyl uses its unique position as liaison between the Oil and Automotive industries. The underlying purpose of all such long range studies is to help engine designers take maximum advantage of high compression and still hold octane requirement to a reasonable level.

How Ethyl Research is helping you

More than 30 years of intensive fuel and engine research experience and extensive research facilities enable Ethyl to contribute to the progress of both the oil and automotive industries.

The instruments and technique described here are just one product of this experience and these facilities.

As always, our Technical Representatives, backed by the extensive facilities of Ethyl's Research Laboratories, want to share their knowledge with your technical people.

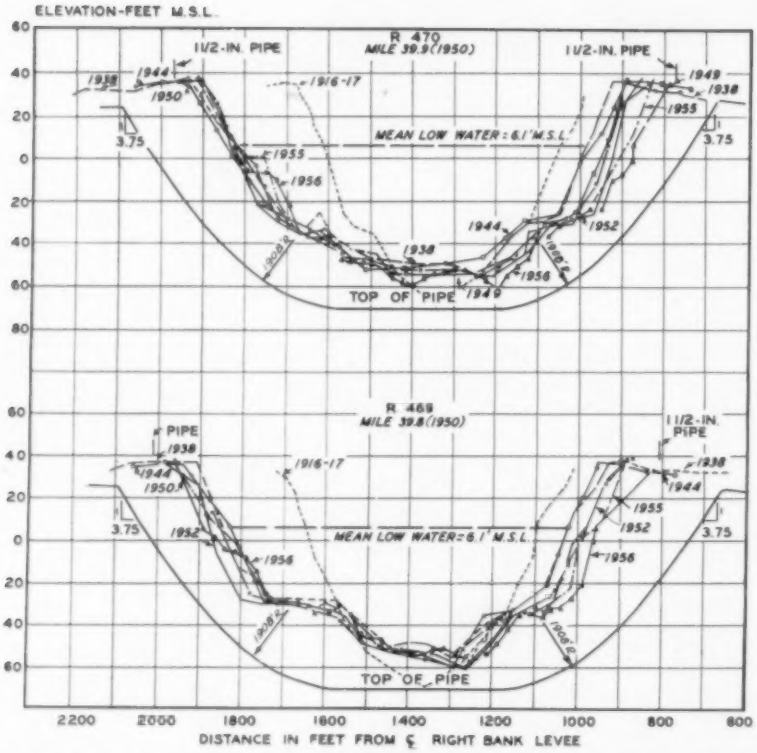
Your Ethyl Representative will welcome the opportunity to arrange an appointment for you.

Send for your free copy of our technical paper entitled, "Determination of True Engine Friction." Address your request to Ethyl Corporation, 100 Park Avenue, New York 17, N. Y.

ETHYL CORPORATION
New York 17, N. Y.

ETHYL ANTI-KNOCK COMPOUND — ETHYL CORPORATION

RESEARCH LABORATORIES:
1600 W. Eight Mile Road, Ferndale 20, Mich.
2600 Cajon Road, San Bernardino, Calif.



CHANGING PROFILES of the Atchafalaya River are well above the top of the 30-in. pipe laid at this crossing. The sag-bend designs permit laying of the pipe without exceeding 20,000 psi. stress. Fig. 8.

Trenching . . . Entrenchment into the banks as well as the decision as to the maximum depth of the pipe in the stream is based to a considerable extent on the comparative study of the cross-sections at the site for the various years of record. Bank entrenchment also must be based on a study of past changes in the horizontal pattern of the river.

A reach that is stable today may be found to be in imminent danger of becoming unstable because of changes which are occurring above or below the site. There are few, if any, places on the Mississippi above Baton Rouge where bank changes cannot be expected to occur more or less rapidly. The decision as to amount of bank entrenchment must be based on an estimate of what the rate of change will be in the future and how long the project is expected to last.

The best method for entrenching the pipe across a large alluvial stream is by means of hydraulic dredging in the bed and in the banks up to the water surface, the trench to be excavated prior to the placing of the pipe. It is not usually necessary to fill the trenches between banks since the river will take care of that in short order.

The bank trenches should be backfilled to restore the original alignment of the bank line if it is practicable to do so. This backfill should be protected by riprap or sandbags and the top of bank shaped so as not to permit drainage to run over the new fill.

Pipe requirements . . . The steel from which the underwater pipeline is made should have as much flexibility as is consistent with strength and weldability requirements. For land lines it has become the practice to raise the yield point by expansion of the pipe to lower the required wall thickness.

Underwater crossings are more inaccessible and a break in such crossing is many times as expensive to repair as a line on land. It is, therefore, very important to specify carefully the steel to be used with regard to ductility as well as strength. Working stresses should be lower than those normally used in land pipe.

Sagbends and overbends, if required, should be bent on the job to fit the trench as actually dug. In many cases it will be found feasible to lay the pipe without prebent bends which is of considerable advantage from the standpoint of laying.

In the design of large pipelines the wall thickness required to take care of the pressure always provides less weight than that necessary to overcome the buoyancy of the empty pipe. This buoyancy must be overcome by the addition of weight to the line.

Weight exceeding that required to overcome the buoyancy as computed on the basis of its displacement of fresh water must be added to cause the pipe to settle into the trench even if it is partially filled with soft silt. For large pipes across the Mississippi River a total weight in air equivalent to about 1.3 times that of the volume of water displaced by the pipe plus the weighting material is sufficient.

This will provide for good placing and insure that the pipe will remain in place until the trench is backfilled. Small pipes are frequently laid directly on the bottom without trenching because of the relative expense involved. Such lines are usually wighted very heavily to resist movement due to currents.

Weighting methods . . . Weighting can be accomplished by increasing the thickness of the pipe; by attaching concrete or steel weights (clamps); or by continuous coatings. The requirement for retention of maximum flexibility should be considered in the choice of a weighting method and material. It is also important, particularly during the laying process, that the area and length of pipe exposed to the current be as small and as smooth as possible.

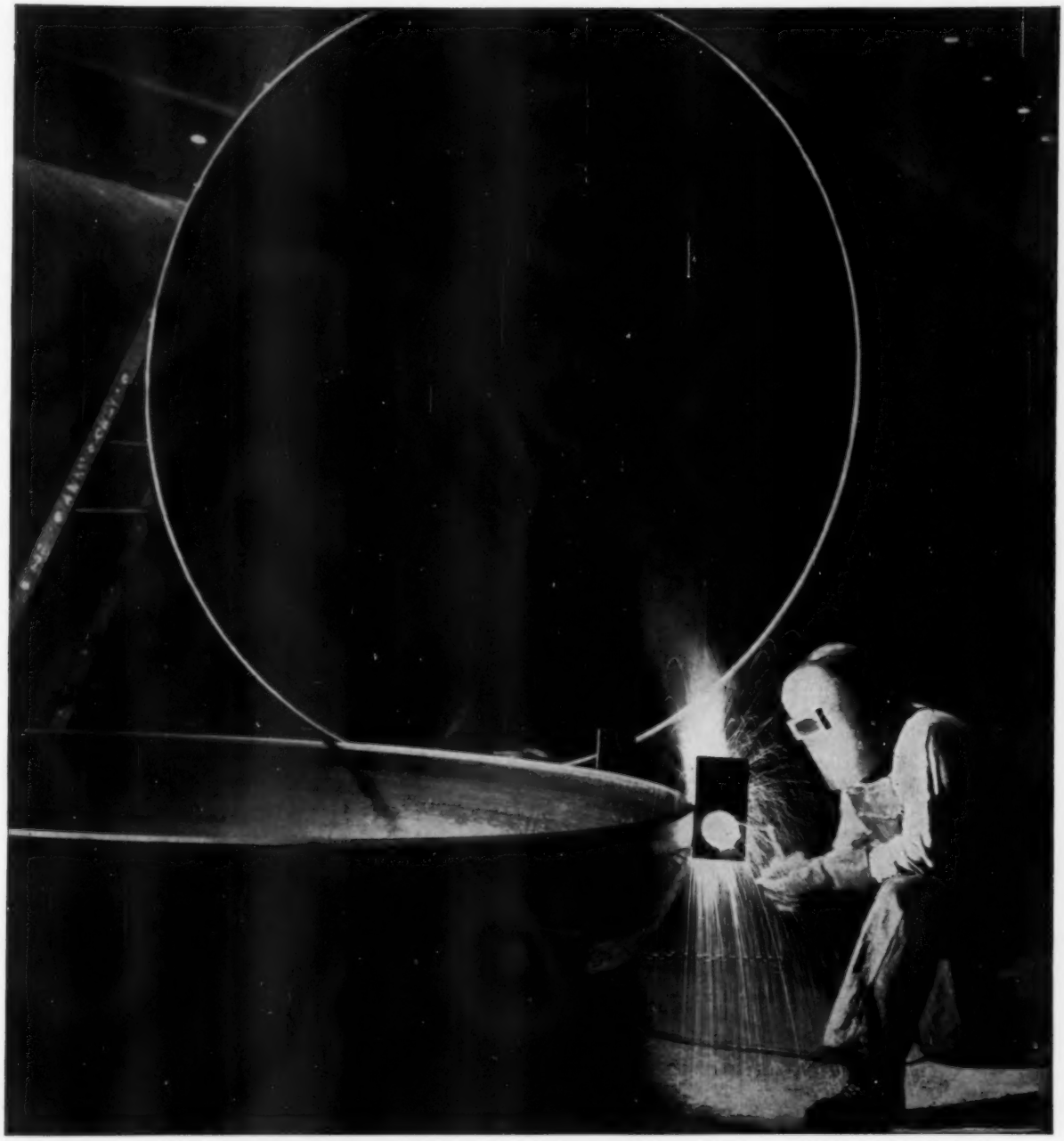
Each method of weighting still has its advocates but the continuous coating, using heavy-aggregate concrete for the coating material, is now much the most commonly used. The use of barite aggregate has been found to provide a strong, durable concrete weighing 185-190 lb. per cu. ft.

The coating methods are such that the surface is left relatively smooth and the coating adheres to the pipe quite tenaciously, protecting the corrosion coating during handling. It also provides the cheapest current method of securing added weight.

Fig. 8 shows design profiles for the main and auxiliary crossings of a 30-in. pipeline across the Atchafalaya River. The profile is well below the bottom elevation of the cross-sections made from all of the surveys that could be obtained. The sag-bend radii will permit laying of the pipeline without stressing it over 20,000 psi. in a longitudinal direction.

The overbends were made cold and coated on the job. The pipe used was .656-in. wall thickness and the coating consisted of 2½-in. thickness of 190-lb. concrete with wire-mesh reinforcement.

(End Part 2)



SOUND WELDS EVERY TIME – Because of the uniformly high quality of steel from which Bethlehem Flanged-and-Dished Heads are made, you get sound welds every time, providing, of course, that proper welding technique is used. And Bethlehem Heads come in a wide variety of types, to suit virtually every requirement. Bethlehem furnishes many types of heads, including ASME Code, standard and elliptical flanged-and-dished. Also flanged-only, dished-only, shallow-dished, tank-car, obround and double-dished. They come in diameters up to 144 in.; in thickness from 14 gage to 2½ in. Bethlehem also produces standard manhole and handhole saddles, covers and fittings, and heads with flued openings. To help you maintain your production schedules, a number of sizes of ASME Code flanged-and-dished heads are stocked for prompt delivery. A line to the nearest Bethlehem sales office will bring you a copy of our stock list.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

FLOOD 3 PROJECT of Signal Oil & Gas. Left to right are office and laboratory, warehouse, filter and pumps, and water tanks.

Five modern water floods in Oklahoma's Washington County show . . .

How to Treat Sour Brine for Flooding

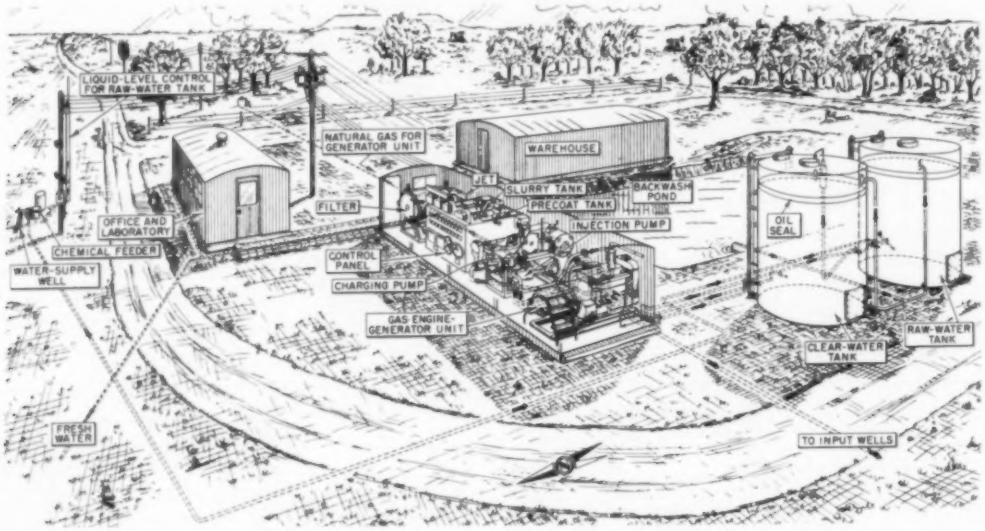
SYSTEMATIC water flooding was first tried in Washington County, Oklahoma, in 1937 jointly by Keener Oil Co. and Phillips Petroleum Co. A second project was begun in 1941 by Oklahoma Oil Corp. A third project was begun in 1945 and the fourth in 1948, but 1949 actually was the beginning of intensive water-flooding development in Washington County. The results of previous water-flooding projects are described in B.M.R.I. 3728, 4795, and 4837.

This report describes four water-flooding projects in Bartlesville-Dewey field and one in Hogshooter field, both in Washington County. Four of these projects are pilot operations, but the fifth is a full-scale project with an area of 325 acres. The projects are of particular interest now because of the new methods of conditioning water and the new equipment that is being used.

One of the projects utilizes a system that completely conditions water for injection in a single tank. It requires only a small lined pond as a settling and storage basin for the aerated brine. Another utilizes a specially designed portable plant where the treating, filtering, and pumping equipment are automatically controlled and the treating and pumping unit, a laboratory, a warehouse, and tanks are mounted for moving from one pilot operation to another. A diatomaceous-earth filter also is incorporated into this compact unit.

One project has a standard open water-treating system that utilizes a blower-equipped aerating tower; another project has an open-type system that uses nozzles to aerate the brine. At one treating plant, after aeration, only relatively new chemical additives are used to treat the water and to control corrosion.

This material is from the Bureau of Mines Information Circular 7787 by J. P. Powell, Bureau of Mines petroleum engineer, Bartlesville, Okla.



SCHEMATIC LAYOUT of Signal's Flood 3 project.

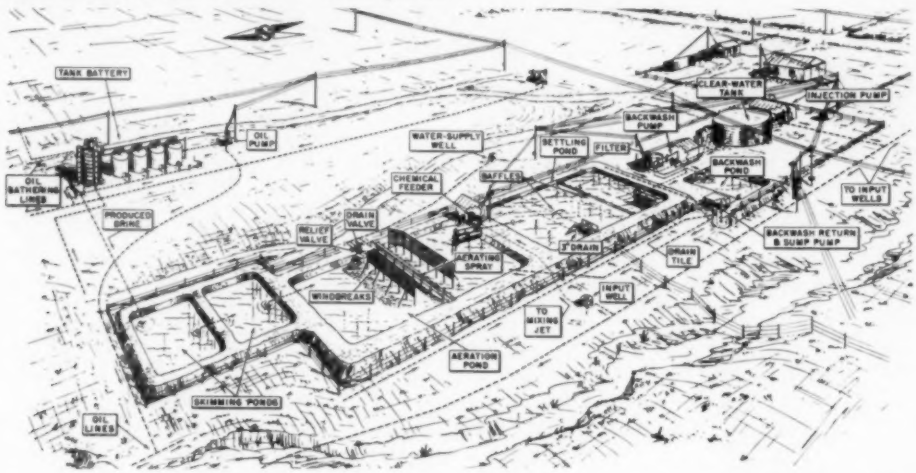
1. Signal Oil & Gas Co., Flood 3 Project

PILOT FLOODING covers 30 acres of the 416 acres of this lease. The project began last October to flood the Wayside sand which is 440 ft. deep and averages 20 ft. thick. Before flooding, cores show: porosity, 18 per cent; air permeability, 25 md.; water permeability, 2.5 md.; oil saturation, 35 per cent; water saturation, 45 per cent. Gravity of the oil is 29.2°.

Arbuckle limestone furnishes water for the flood from a well 2,438 ft. deep. The brine is pumped to a 130-bbl. steel tank where an oil seal is maintained. From the tank, the brine passes through a pressure leaf filter and then to the clear-water tank where an oil seal also is present. A triplex pump with a variable-speed drive forces water to the distribution system at 250 psi.

An unusual feature of the plant is the compact portable treating and pumping unit. All units are skid-mounted. The generator can provide electric power for all equipment operation and supply several pumping wells in addition. The filter has glass-fiber leaves covered with saran cloth bags. Diatomaceous earth mixed with fresh water in a slurry tank is injected into raw water continuously. Periodically the filter cake is removed by rotating the filter leaves past jets of clear water.

2. Baird Oil Co., Unit 1 Project

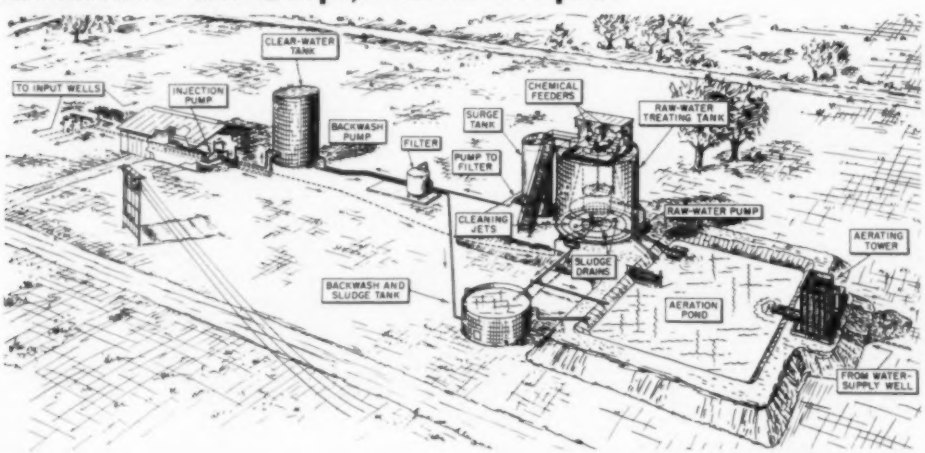


ABOUT 225 ACRES is under flood in this project. The 28 input wells and the 25 producing wells are in five-spot patterns with like wells 660 ft. apart. Formation flooded is Bartlesville sand in Hogshooter field. The depth is 1,120 ft. and thickness averages 25 ft. Core tests are: porosity, 18 per cent; permeability, 32 md.; oil saturation, 27 per cent; water saturation, 38 per cent. Oil is 38.8° A.P.I. gravity.

Flood water is from the Arbuckle limestone. A submersible electric pump lifts water from the 1,807-ft. well through tubing set at 760 ft. Arbuckle brine is aerated and then mixes with produced brine. The water in the aeration pond flows into the chemical treater where chemicals are added by dry feeders in proportion to water passed. Lime and copper sulfate (for bacteria inhibition) are used.

Treated water goes to settling pit where it passes over and under cement-asbestos baffles. An automatic float control actuates a centrifugal pump feeding the pressure sand filter to maintain adequate water supply. Following storage in the 1,600-bbl. wooden clear-water tank, injection water is pumped to the distribution system at 500 psi.

3. Bonaventure Oil Corp., Karns Project



CONSTRUCTION of this pilot water-flood plant began in November 1956, to test-flood the Bartlesville sand. Eight injection wells are used. Depth of the Bartlesville is 1,130 and it is 20 ft. thick. The sand is in lenses which grade into shale or impermeable sand. Cores show: porosity, 19 per cent; permeability, 15 md.; oil saturation, 32 per cent; water saturation, 38 per cent. Oil is 36° A.P.I. gravity.

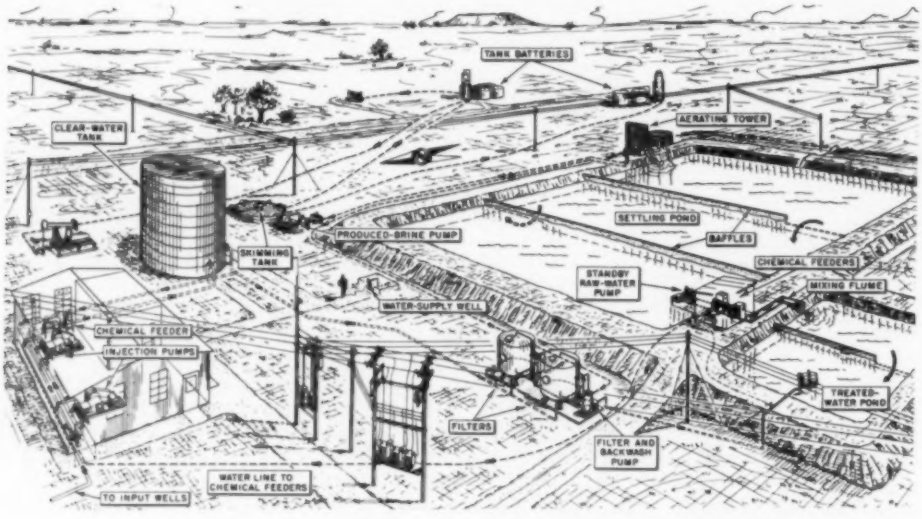
A well 2,298 ft. deep supplies Arbuckle water for the flood. A submersible electric pump lifts the water and forces it into the tray-type aeration tower which is equipped with an electrically driven blower. The water leaves the lined settling pit to enter the treating tank where it receives treating chemicals.

In the treating tank, an impeller forces brine through a central flume, where chemicals are added, then down through a hood into

a precipitation zone. Clear water rises to a collector ring and enters the surge tank. Sludge is withdrawn automatically to the sludge tank.

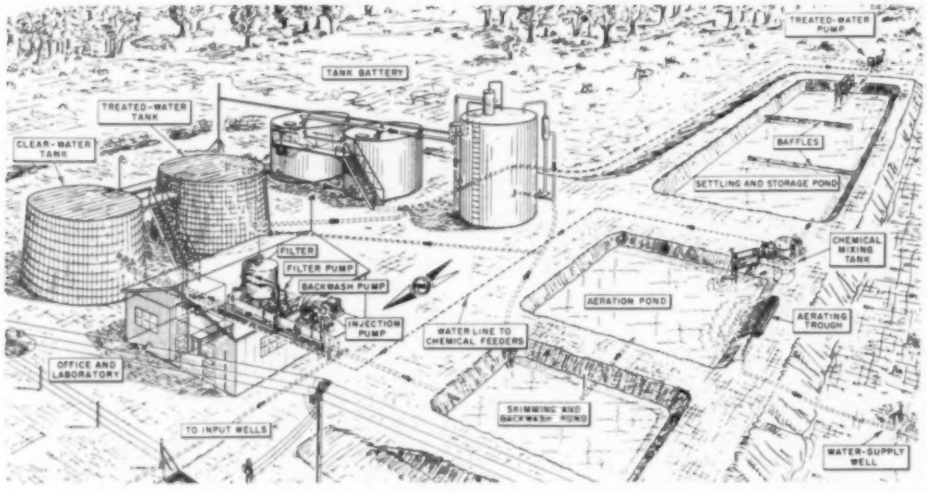
A centrifugal pump, automatically operated by float switches, periodically empties the surge tank and forces water through a pressure sand filter and into the clear-water tank. Floats and electric contacts control the pumping equipment. Pumping pressure was 60 psi. in March.

4. Bonaventure Oil Corp., Wayside Project



THIS successful water flood began in 1953 and now includes 325 acres of 1,080 under lease. A five-spot pattern is used with 44 input wells and 69 producing wells currently active. Formation flooded is the Wayside sand which is 500 ft. deep and 25 ft. thick. Porosity is 21 per cent; permeability, 33 md.; oil saturation in core, 25 per cent; and water saturation, 45 per cent. A.P.I. gravity of the oil is 32°. A submersible electric pump supplies water from the Arbuckle formation, 1,487 to 2,097 ft. deep. The mixture of Arbuckle brine and produced water is aerated, passes through the large settling pond, is treated by lime and other chemicals, then is retained in the small settling pond till filtered. A centrifugal pump picks up the water and puts it through pressure sand filters. Citric acid is injected into the intake of the filter pump. A corrosion inhibitor is later injected into the intake of the injection pump. This pump forces water into the distribution system at 450 psi.

5. Fred P. Schonwald, Morrison Project



THE PERU SAND is the object of this pilot water flood. Water is injected into 20 wells in the 52-acre project which is part of a 470-acre project in Bartlesville field. Injection began in September 1956 but the 12 oil wells are not at present being produced.

Depth of the formation is 600 ft. and average thickness is 40 ft. although as much as 70 ft. exists in some wells. The sand is fairly clean with a porosity of 18 per cent. Oil gravity is 38° A.P.I.

Fresh water was first injected into the formation. This supply proved inadequate and has been replaced by Arbuckle water from a 2,345-ft. well. After aeration the water flows into the mixing tank where sodium polyphosphate, corrosion inhibitor, and germicide are added to it. Each chemical is fed in proportion to the water injected.

Treater water from the settling pond is stored in a 1,000-bbl. wooden tank. Then it is forced through a pressure sand filter and into the clear-water tank. Injection water leaves the plant at 380 psi. The injection pump is equipped with low and high-pressure automatic switches and liquid-level switches control water supply.

MISSION Super-Service® LINER PACKING

MISSION Super-Service Slush Pump Liner Packing outwears all other types.

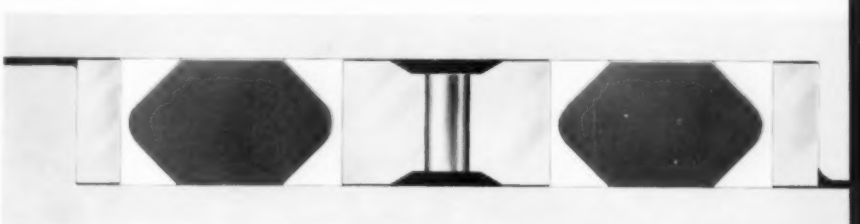
Under severe conditions (high pressures and worn pump bores) Mission Packing has outlasted others by as much as ten times.

Furthermore, Mission Super-Service Packing stays in adjustment. Since costly wear is reduced, frequent re-tightening is seldom required.

The reason for this outstanding performance is the *zero* clearance design shown below.

Write for the bulletin that tells the whole story. Better yet, try Mission Super-Service Liner Packing in your pumps. They are made in many popular sizes and are sold through all supply stores.

This cross-section shows how nylon back-up rings expand to provide zero clearance and perfect containment of packing elements when tightened. The metal end ring restores worn shoulders—adding reinforcement to the nylon. The result is long life with minimum adjustment.



Nothing but the finest will bear the name of MISSION MANUFACTURING CO

MISSION MANUFACTURING CO. • *P. O. Box 4209* • *Houston, Texas* • *Cable Address—"Missco"* • *Export Office: 30 Rockefeller Plaza, New York*
In The United Kingdom: MISSION MANUFACTURING CO., LTD. • *17 Hanover Square* • *London, W. 1, England* • *Cable Address—"Missoman"*
SLUSH PUMP VALVES • PISTONS • VALVE SEAT PULLERS • LINERS • PISTON RODS • VALVE SPRINGS • GLAND PACKINGS • • SLIPS • SWABS • PLUG VALVES • CENTRIFUGAL PUMPS

BRAWN on rubber

to handle 2 tons of pipe!

Here's built-in strength and stamina to cut your pipe handling costs—with wheel tractor mobility and low investment cost! With combination pipe layer and side boom on the heavy-duty International® 350 Utility tractor . . . you can stockpile, load, unload, carry and string 16-inch welded pipe, 16-inch cast iron pipe, and 24-inch concrete pipe. You can work unrestricted on paved streets and highways as well as in open country . . . shift locations at speeds up to 16.8 mph. Investigate! See *why* the International 350 Utility leads its field for unsurpassed capacity and dependability.

Bigger backhoe bites! Users report built-in brawn of International 350 Utility steps up trenching yardage as much as 25%—compared with lightweight outfits.

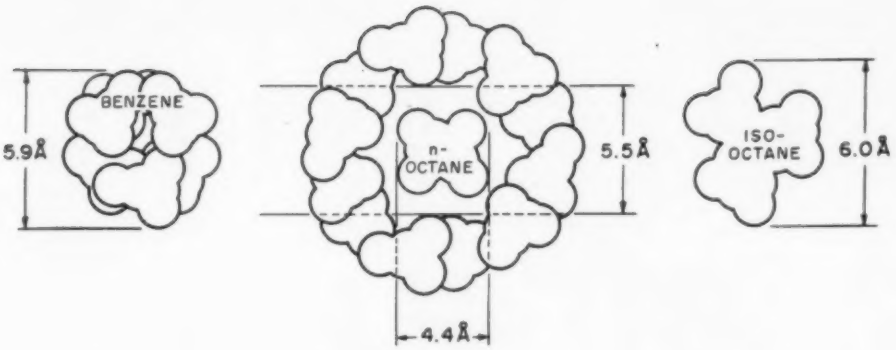
Another cost-cutting combination—the International 350 Utility tractor with continuous-type trencher. Digs collector line and other trenches 5 to 14 inches wide, to 6 feet deep.

See Your

INTERNATIONAL HARVESTER Dealer

International Harvester products pay for themselves in use—McCormick Farm Equipment, Farmall and International Tractors . . . Motor Trucks . . . Construction Equipment—General Office, Chicago 1, Illinois.

One of 5,000 IH dealers is located near your job. Look in the classified directory, or write International Harvester Company, P. O. Box 7333, Dept. OGJ-6, Chicago 80, Illinois, for the name of your nearest dealer. See for yourself how International 350 Utility power and brawn give you *top dollar value!*



THIS ILLUSTRATES selectivity of adduct formation, which is a function of the cross-section of the hydrocarbon molecule as related to the geometry of the urea crystal. Fig. 1.

Urea adduction—a process for making

Light, Low-Pour Lubes From Waxy Crudes

By T. H. Rogers, J. S. Brown, Robert Diekman, and G. D. Kerns

It's a New Technique

For years, wax-free crudes have been used to make oils with pour points of —20° to —50° F. that are needed for refrigerator oils, transformer oils, automatic-transmission fluids, hydraulic fluids, and lubricants for arctic service. The growing scarcity of such crudes prompted us to study ways of producing the oils from waxy crudes.

Conventional solvent dewaxing to pour points below 0° F. was not considered practical because of the expense of the extremely low temperatures that would be required.

A new separation technique that operates at ordinary temperatures—urea adduction—offered a possible approach to the development of a process for dewaxing oils to low-cold-test quality. In this technique, separation of mixtures of organic substances is based on the formation of a solid complex.

In 1940, in Germany, Friederich Bengen discovered that urea and n-decyl alcohol formed a crystalline complex when mixed.[1,6] He soon found that straight-chain hydrocarbons like n-octane formed similar complexes with urea, whereas branched-chain hydrocarbons like iso-octane would not.

Upon disclosure of Bengen's discovery, which did not come until after the war, work on this phenomenon was promptly undertaken in many laboratories.[2-5]

A NEWLY DEVELOPED urea-adduction process has proved to be a practical way of making light lubricating oils of low pour point from waxy crudes. Two-step operation involving solvent dewaxing followed by urea dewaxing combines the best features of both. Urea dewaxing will probably not be advantageous for producing medium-pour-point oils from waxy crudes, but it might be useful for one-step dewaxing of stocks that contain little wax.

Many other applications of urea separation have been proposed. Some in the petroleum field are recovering straight-chain hydrocarbons, producing low-pour-point jet fuels, and raising octane number of gasoline. Many of the separations are technically feasible, and commercialization of them only awaits economic justification.

Urea adduction . . . Urea selectively crystallizes around paraffinic hydrocarbons with long straight chains to make a solid, filterable complex or adduct. This selectivity of adduct formation is a function of the cross-section of the hydrocarbon molecule as related to the geometry of the urea crystal.

Fig. 1 shows in cross-section these relationships for hydrocarbon molecules of different shapes and sizes. In forming the adduct, the urea crystal forms a channel large enough to accommodate straight-chain hydrocarbon molecules like n-octane, but not cyclic or branched-chain hydrocarbons like benzene or iso-octane.[7]

Authors are with Standard Oil Co. (Indiana), Whiting, Ind. Paper presented at W.P.R.A. meeting, San Antonio.

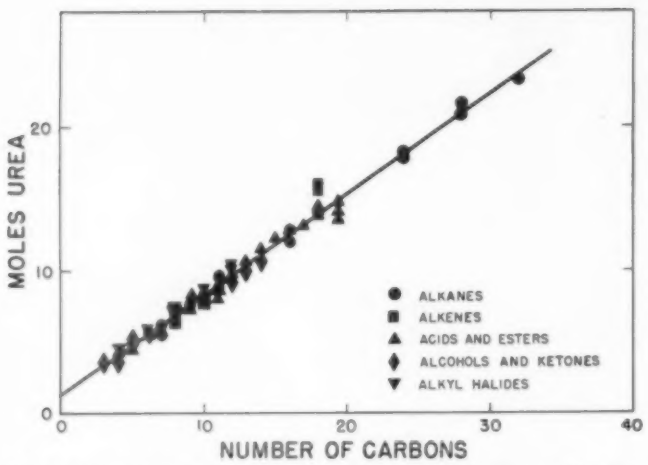
Several molecules of urea are needed to form a complex with one molecule of an organic compound. Contrary to the rule for a strictly chemical reaction, this ratio changes with the molecular weight of the compound. Fig. 2 shows that approximately 0.7 mole of urea is required for each carbon atom.[6] However, because molecular weight is nearly proportional to the number of carbon atoms, the ratio on a weight basis is almost constant—roughly 3 lb. of urea to 1 lb. of hydrocarbon.

Exploratory Studies

To explore the possibilities of adduction as a separation process, our laboratory undertook a general study of the variables of this reaction. Because of the straight-chain character of paraffin wax, waxy distillates were included in the reactants studied, as well as naphthas and pure hydrocarbons. Early findings were published several years ago;[8,9] parallel work by others is in good agreement.[2-5]

An activator, such as methanol, is essential to complete adduct formation in a reasonable time. With either a small amount or enough to dissolve the urea, adduct formation with straight-chain hydrocarbons is complete in a few minutes to an hour or more. The time required increases with increasing molecular weight of the hydrocarbon. Water, other alcohols, esters, and ketones may also be used as activators.

Wax adducts stable . . . The adducts of hydrocarbon waxes are stable enough to be washed with inert solvents to remove uncomplexed hydro-



ABOUT 0.7 MOLE of urea is required for each carbon atom. The ratio changes with molecular weight but since molecular weight is nearly proportional to number of carbon atoms, the ratio on a weight basis is almost constant. Fig. 2.

carbons. Without this stability, urea adduction would not be a practical separation tool. Large amounts of raffinate liquid would be occluded in the adduct solids after settling, filtering, or even centrifuging.

The adduct can be decomposed and the original components recovered by agitating at room temperature with a good solvent for urea, or by heating. Water is commonly used in the laboratory, often with some heating.

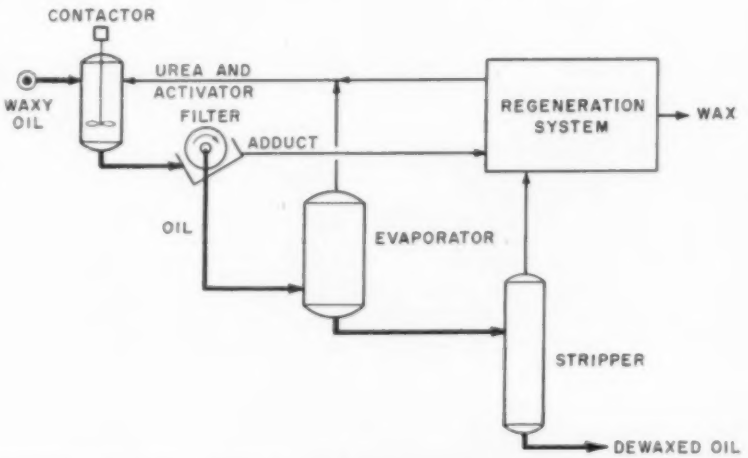
For decomposition by heat alone, a temperature of 200° F. will quickly decompose adducts of high-molecular-weight hydrocarbons. The ease with which the components of the adduct can be recovered is obviously advantageous for commercial operation.

Such experiments indicated that petroleum distillates could be dewaxed by contacting them with urea and an activator, separating the crystalline adduct from dewaxed oil, and heating the adduct to recover urea and wax. Time, temperature, and separation conditions seemed adaptable to a commercial process.

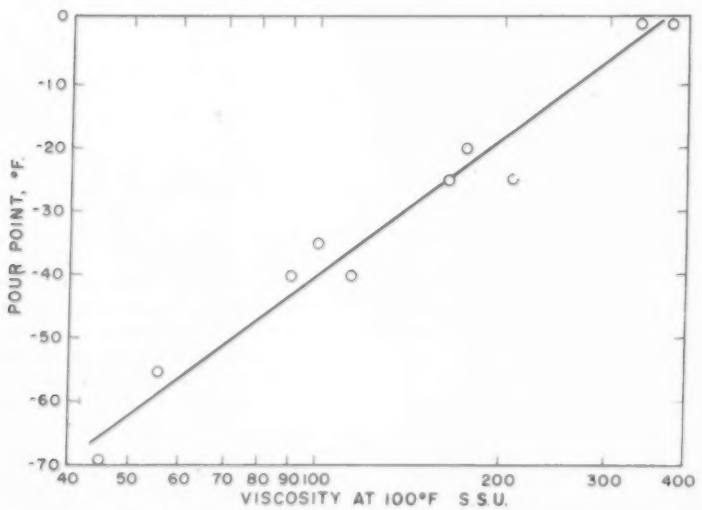
Preliminary cost estimates indicated that urea dewaxing could not usually compete with solvent dewaxing, although L. Sonneborn is operating a urea plant for removing small amounts of wax from white oils,[3] and Deutsche Erdol has recently installed a urea process for dewaxing spindle oils.[4]

Process Development

Our consideration of the problem of producing light lubricating oils of subzero pour point from waxy distillates led to the concept that urea dewaxing should be considered as a



CONTINUOUS UREA ADDUCT dewaxing process. It operates at ordinary temperatures in contrast to conventional dewaxing process which requires temperatures in the order of —50° F. Fig. 4.



PROPERTIES of dewaxed oil are given by this correlation. This plot gives results of bench-scale tests made to explore practicability of two-step operation. Fig. 3.

complement to conventional dewaxing. Urea dewaxing could not be expected to compete with solvent dewaxing for lowering the pour test as far as 0° F., but it seemed well suited to further lowering the pour test of oils previously dewaxed by established techniques.

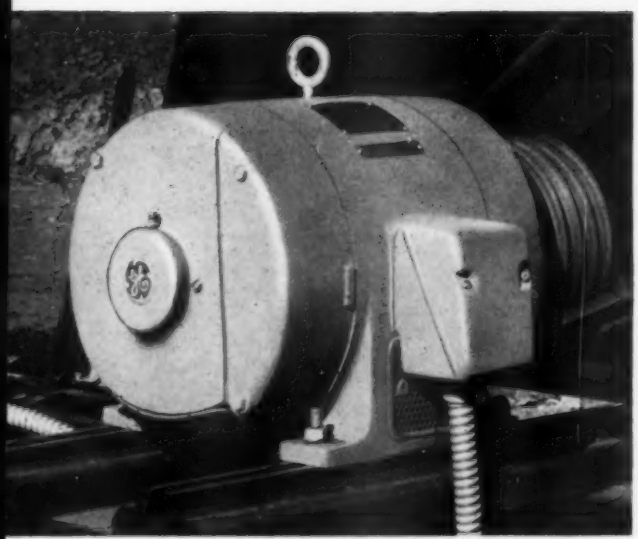
Our study was therefore directed to a two-step operation: solvent or other conventional dewaxing, followed by urea dewaxing.

Bench-scale tests were made to explore the practicability of this two-step operation with the results shown in Fig. 3. Desired pour points of —40° to —50° F., were obtained by urea dewaxing of previously dewaxed Mid-Continent stocks of 0° to 25° F. pour point. The pour point of urea-dewaxed stocks varies greatly with viscosity, primarily because some of the waxy hydrocarbons in the

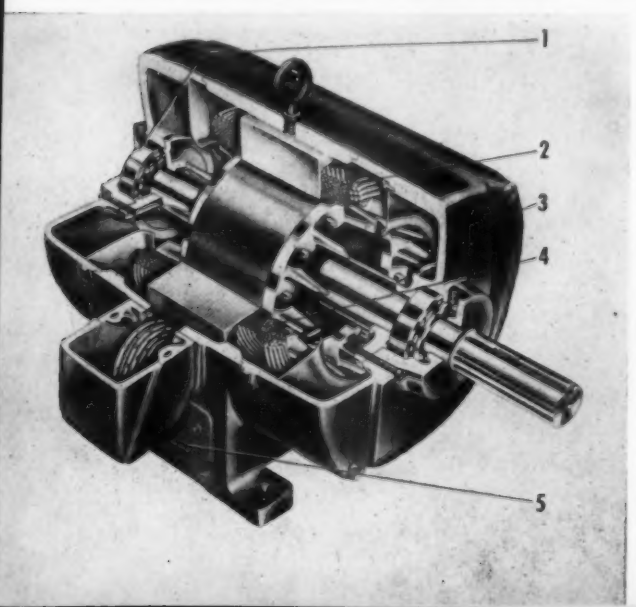
INSTALL IT... FORGET IT!

EASY-TO-MAINTAIN G-E TRI 55 CLAD MOTORS LAST LONGER

REG. U.S. PAT. OFF.



GREATER RIGIDITY AND STRENGTH of cast-iron frame and end shields prevent motor from being twisted out of line. Integrally cast ribbing on underside adds extra support.



General Electric's all-new Tri-Clad '55' oil field motor is specifically designed for long-life, easy-maintenance operation on your pumping applications. Protected against burnouts, dust and moisture, the new motor will run far longer without attention than ordinary motors.

Burnout protection for longer life—Burnouts are virtually eliminated with new Class 'B' insulation system utilizing Alkenex® heat-resistant wire enamel, and mica-glass laminate slot and phase insulation. This new system allows up to 40% higher temperature rise, yet extends motor life.

Advanced bearing system for easier maintenance—Under normal operating conditions, the advanced bearing system will operate longer without regreasing than any other motor bearing system. Effective seals on both sides of bearing housing keep grease in and dirt out, giving you all the service the long-lasting lubricant can deliver. Large grease reservoir *reduces maintenance to a few minutes every 5 years*. Pipe plugs on bearing housing permit regreasing even when motor is operating.

Greater physical protection for outdoor service—The new Tri-Clad '55' motor is built to take the weather. End shields and frame are rust-resistant cast iron. The insulation system virtually eliminates breakdown due to moisture. Air vents are protected, and removable screens guard against animal and rock damage.

Complete information available locally—For full details on the easy-to-maintain, long-life Tri-Clad '55' oil field motor, contact your local G-E motor distributor or your nearby General Electric Apparatus Sales Office. General Electric Company, Schenectady 5, N. Y. 899-1

CHECK THESE YEARS-AHEAD FEATURES

1. Advanced bearing system will last longer without regreasing than any other bearing system.
2. Water-shedding stator windings virtually eliminate breakdown due to moisture.
3. Rugged cast-iron frame helps prevent rust and accidental damage.
4. Class 'B' insulation system with revolutionary Alkenex® wire enamel allows up to 40% higher temperature rise . . . yet extends motor life.
5. Removable screens protect G-E oil field motors against damage from rodents and rocks.

Progress Is Our Most Important Product

GENERAL ELECTRIC

higher viscosity range are not adductable with urea.

The two-step operation removes about the same amount of wax as solvent dewaxing to the same pour point. These data indicate that the urea technique is particularly well adapted to the light lubricating stocks most often used for low-cold-test oils.

Pilot-plant studies . . . These findings led to an extensive pilot-plant program. Feeds used were refinery solvent-dewaxed oils that ranged in viscosity from 50 to 220 S.U.s. at 100° F. Three sizes of contactors were used to study process variables and to prepare slurries for filtration tests. A 12-in. plastic contactor was employed for both batch and continuous experiments. A smaller reactor of glass and a larger one of steel were also successfully used.

Results obtained from urea dewaxing three feeds are shown in Table 1. The low pour point of the products confirmed the findings of the bench-scale work. As in any dewaxing operation, removal of a paraffinic by-product raises viscosity and lowers viscosity index. The by-product consists of bright liquid waxes of unusually high gravity and high viscosity index. They are being studied for special uses and as chemical raw materials.

An adduct cake that can be handled and washed in an inexpensive, conventional rotary filter was readily obtained. The cake has good porosity and moderate compressibility, can be washed in place on the drum, and discharges cleanly from the cloth.

The Developed Process

The pilot-plant program led to the development of a continuous process, as shown in Fig. 4. It operates at ordinary temperatures, in contrast with temperatures below —50° F. that would be required for conventional dewaxing processes.

Low-cold-test oil is separated from the adduct on a rotary filter of conventional design. The adduct cake is decomposed into urea, which is recycled to the process, and the paraffinic by-product.

The process is designed particularly for dewaxing light lubricating stocks of 50 to 220 S.U.s. viscosity at 100° F. to the pour points shown in Table 1. Because low-viscosity feeds contain more adductable material, feed rate and product yield vary with feed viscosity as shown in Table 2.

TABLE 2—VARIATIONS OF FEED RATE WITH VISCOSITY

Feed viscosity, S.U.s. at 100° F.	Feed rate, bbl. per stream day	Prod. yield Vol.%
50	900	85
80	1,000	86
220	1,200	94

Investment . . . Investment cost for a plant to process these quantities of feed has been estimated at $850,000. A solvent-dewaxing plant designed to do the same job would be much more expensive. Direct comparison of the two would therefore have little significance. For orientation, however, a conventional solvent-dewaxing plant of the same size, but designed to produce an oil of 0° F. pour point, would cost about the same amount.

Operating costs for the two processes, in cents per gallon of product, are also about the same:

OPERATING COSTS

	Urea dewaxing for low-pour oils (cents per gal. product)	Solvent dewaxing for medium-pour oil (cents per gal. product)
Labor	0.6	0.6
Maintenance	0.7	0.3
Utilities	0.8	1.1
Chemicals and solvents	0.1	0.1
Total	2.2	2.1

Most solvent dewaxing plants are larger and, therefore, more economic. Liberal allowance has been made for maintenance in the case of urea dewaxing, because of lack of experience with full-scale operation; maintenance costs may well be lower in the long run.

A plant employing the developed process has just been built at Standard's refinery at Whiting, Indiana. Process and mechanical features are now being tested preparatory to the first run.

TABLE 1—PROPERTIES OF FEEDS AND PRODUCTS

	Pour point, °F.	Gravity, °A.P.I.	Viscosity 100°	Viscosity 220°	V.I.	Refractive index n (20/D)
50-viscosity oil; 10 per cent adductable						
Feed	15	30.5	59	35	78	1.4858
Dewaxed oil	—55	29.0	64	35	69	1.4898
Liquid wax	75	46.1	44	32	139	1.4449
80-viscosity oil; 7 per cent adductable						
Feed	35	28.6	82	37	75	1.4906
Dewaxed oil	—40	26.9	92	38	61	1.4953
Liquid wax	60	43.0	55	35	158	1.4460
220-viscosity oil; 4 per cent adductable						
Feed	0	26.0	229	51	66	1.4990
Dewaxed oil	—25	25.6	246	47	64	1.5002
Liquid wax	80	40.8	68	38	167	1.4579

References

1. Bengen, M. F., German Patent Appl. O. Z. 12438 (March 18, 1940); Pat. 869,070 (January 22, 1953).
2. Brooks, B. T., Boord, C. E., Kurtz, Jr., S. S., and Schmerling, L., "The Chemistry of Petroleum Hydrocarbons," Vol. 1, pp. 241-274, Reinhold, New York, 1954.
3. Chem. Eng. 63, 114 (1956).
4. Hoppe, A., and Franz, H., Erdol u. Kohle 8, 411 (1955).
5. Kobe, K. A., and Domask, W. G., Petroleum Refiner 31, No. 3, 106; No. 5, 151; No. 7, 125 (1952).
6. Marschner, R. F., Chem. Eng. News 33, 494 (1955).
7. Schlenk, W., Jr., Ann. 565, No. 3, 204 (1949).
8. Zimmerschied, W. J., Dinerstein, R. A., Weitkamp, A. W., and Marschner, R. F., J. Am. Chem. Soc. 71, 2947 (1949); Ind. Eng. Chem. 42, 1300 (1950).
9. Zimmerschied, W. J., Higley, W. S., and Lien, A. P., Petroleum Eng. 22, No. 7, C-43 (1950).

BOOKS

A GUIDE TO THE LITERATURE OF CHEMISTRY 1957 by E. J. Crane, Austin M. Patterson, and Eleanor Marr. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, New York. 397 pp. $9.50.

This book is an effective key to the vast chemical literature. This second edition has been revised and expanded and has been brought up to date to keep pace with the rapid growth of chemical literature in recent years.

The authors analyze various kinds of sources of chemical information and describe and classify them. They give ways of keeping up to date on various sources and discuss libraries and indexes in relation to the literature searches.

This book is a guide to books, periodicals, patents, government publications, trade literature, indexes, libraries, and other sources.

PROJECT ENGINEERING OF PROCESS PLANTS, by Howard F. Rase and M. H. Barrow. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, New York. 692 pp. $14.95.

This is the first book to recognize the new field of project engineering and to formalize the methods of executing a project used by all progressive chemical companies and engineering firms. It is written from the viewpoint of the project engineer, but it is not limited to his use. Any engineer whose work requires a knowledge of theory and techniques of mechanical design and procurement in construction will find it valuable.

The book is divided into four major parts: major steps in plant design; business and legal procedures; details of engineering design and equipment; selection and construction of the plant.

The book contains many excellent illustrations of the equipment and examples of actual design calculations, specifications, and contracts.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

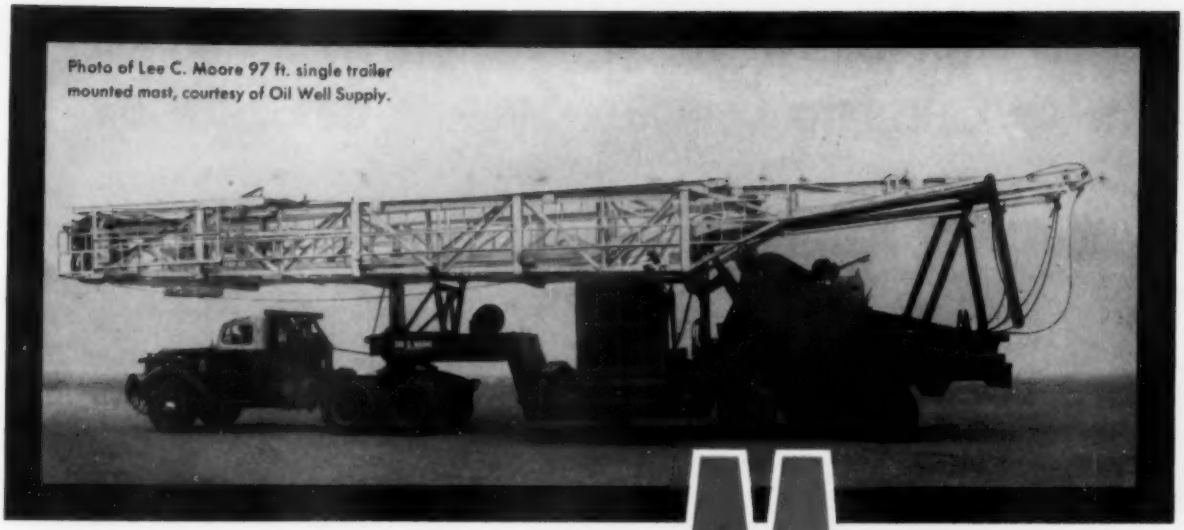


Photo of Lee C. Moore 97 ft. single trailer mounted mast, courtesy of Oil Well Supply.

LEE C. Moore CORPORATION

TRAILER MOUNTED MASTS

FAST SIMPLE RUGGED

LEE C. MOORE Trailer Mounted Masts are designed for maximum mobility and efficiency. Well loads are inside the mast structure, thus eliminating guy lines.

Furnished either with a substructure or with simple bearing beam and screw jacks.

Designed to accommodate a variety of drawworks and power combinations.

Extended in horizontal position — FOR SAFETY.

Legs in true alignment when mast is extended — NO OVERLAP.

Traveling blocks are carried in the mast with lines strung.

SINGLE TRAILER MOUNTED MASTS

86 ft./94 ft./97 ft./97 ft. Heavy duty /100 ft./126 ft. Export Model

DUAL TRAILER MOUNTED MASTS

97 ft./100 ft./126 ft./126 ft. Export Model

LEE C. MOORE CORPORATION — TULSA : HOUSTON : NEW ORLEANS : CENTRALIA : ODESSA : MIDLAND : DALLAS : GREAT BEND : CASPER : PITTSBURGH

EXPORT OFFICE: ROOM 624, INTERNATIONAL BLDG., 630 5TH AVE., NEW YORK 20, N. Y.

FOREIGN LICENSED MFR.: OIL WELL ENGINEERING CO., LTD., CHEADLE HEATH, STOCKPORT, ENGLAND

ELEMENTS OF FIELD PROCESSING—37

How to Calculate Complex-System Gas Flow

By Dr. John M. Campbell

MANY gas-flow calculations involve some form of complex system. When such a need arises it becomes necessary to properly analyze the system before making the necessary flow calculations. In fact, the analytical portion of the problem is all important, for any of the applicable flow equations may be used.

For convenience, all derivations are made with Weymouth's equation, but Table 1 shows the equivalent form of the Panhandle and Clinedinst equations.

Systems of Parallel Lines

Parallel or loop lines are used to increase the amount of flow per pound of pressure drop. In one case a line is looped to increase the capacity without increasing the pressure drop. In another, the pressure on the line must be lowered, so a loop is added to maintain the desired flow rate.

Author is chairman, school of petroleum engineering, University of Oklahoma, Norman.

Fig. 1a illustrates a simple loop system where original line A has been partially looped with line B. The purpose of line B is to decrease the pressure drop between P_1 and P_A per unit quantity of gas flowing, so that the reduction will compensate for the increased pressure drop from P_A to P_2, when the flow rate is increased, or the pressure is lowered.

Using the same principles as those applied to liquid flow in Part 31, it is apparent from Fig. 1a that

$$Q_A + Q_B = Q_C = Q \text{ Total} \quad (1)$$

$$\Delta P_A = \Delta P_B \text{ (since they have two points in common)} \quad (2)$$

$$\Delta P_A \text{ (or } \Delta P_B) + \Delta P_C = \Delta P \text{ Total} \quad (3)$$

Now Weymouth's equation may be written as

$$Q = 433.45\, T_s/P_s \times [(P_1^2 - P_2^2)/LGTZ_a]^{1/2}\, D^{8/3} \quad (4)$$

and may be applied for any single line between any two points between which no work is added or withdrawn.

Inasmuch as the same gas is flowing through both lines, Equation 4 may be written

$$Q = K\,(D^{16/3}/L)^{1/2} \quad (5)$$

where K encompasses all of the terms that are constant among the loop lines.

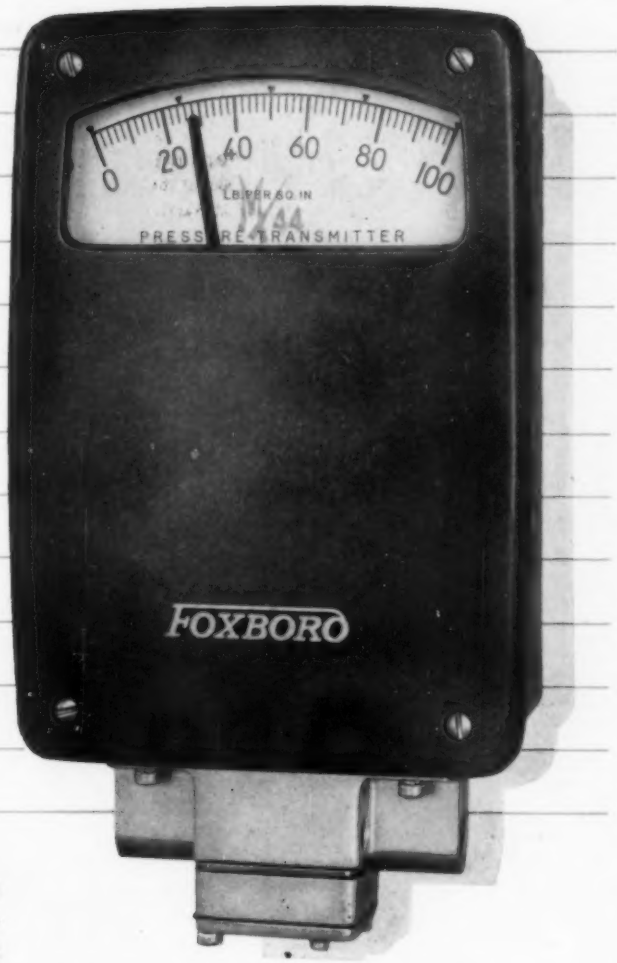
Table 1—Comparison of Complex Formulas for Different Flow Equations

QUANTITY	WEYMOUTH	CLINEDINST	PANHANDLE
LINES IN SERIES			
EQUIVALENT DIAMETER	$D_1 = D_2 \left(\frac{L_1}{L_2}\right)^{3/16}$	$D_1 = D_2 \left(\frac{L_1}{L_2}\right)^{1/5}$	$D_1 = D_2 \left(\frac{L_1}{L_2}\right)^{0.2060}$
EQUIVALENT LENGTH	$L_1 = L_2 \left(\frac{D_1}{D_2}\right)^{16/3}$	$L_1 = L_2 \left(\frac{D_1}{D_2}\right)^{5}$	$L_1 = L_2 \left(\frac{D_1}{D_2}\right)^{4.854}$
LINES IN PARALLEL			
EQUIVALENT DIAMETER	$\frac{D_o^{8/3}}{L_o^{1/2}} = \frac{D_1^{8/3}}{L_1^{1/2}} + \frac{D_2^{8/3}}{L_2^{1/2}}$	$\left(\frac{D_o^5}{L_o}\right)^{1/2} = \left(\frac{D_1^5}{L_1}\right)^{1/2} + \left(\frac{D_2^5}{L_2}\right)^{1/2}$	$\frac{D_o^{2.618}}{L_o^{0.5394}} = \frac{D_1^{2.618}}{L_1^{0.5394}} + \frac{D_2^{2.618}}{L_2^{0.5394}}$
LOOPING REQUIREMENTS*	$X = \frac{1-\left(\frac{Q}{Q_1}\right)^2}{1-\left[\frac{D^{8/3}}{D^{8/3}+D_1^{8/3}}\right]^2}$	$X = \frac{1-\left(\frac{Q}{Q_1}\right)^2}{1-\left[\frac{D^{5/2}}{D^{5/2}+D_1^{5/2}}\right]^2}$	
ENTIRE LINE LOOPED*	$\frac{Q_1}{Q} = \left[1+\left(\frac{D_1}{D}\right)^{8/3}\right]$	$\frac{Q_1}{Q} = \left[1+\left(\frac{D_1}{D}\right)^{5/2}\right]$	
DIAMETER OF ORIGINAL AND PARALLEL LINES THE SAME*	$X = 4/3\left[1-\left(\frac{Q}{Q_1}\right)^2\right]$	$X = 4/3\left[1-\left(\frac{Q}{Q_1}\right)^2\right]$	

*ASSUMES THAT THE LENGTH OF ALL LINES IN THE LOOP SECTION ARE THE SAME LENGTH

Unique combination of fine engineering and economy!

...the new FOXBORO M/44 INDICATING PRESSURE TRANSMITTER



- **Easier to Read . . . large indicator scale, visible at 20 ft.**
- **Easier to Calibrate . . . simple adjustments "on location"**
- **More Compact . . . single, integral instrument**

Any way you look at it, the new Foxboro M/44 Pneumatic Pressure Transmitter gives you an unmatched combination of fine engineering and economy. First; because it *is* an engineered instrument. There are no attachments or "makeshifts". Second; because it utilizes standard Foxboro parts throughout—parts which have been performance-proved in thousands of successful installations of other Foxboro Instruments. And this means not only top performance, but easier servicing and stocking as well. Third; calibration is simple, right in the field, because the M/44 is "convenience-designed" by men with years of experience in every phase of instrument design and application.

In appearance, too, the M/44 has unmistakable Foxboro quality. Features like the high-legibility indicator scale, the compact drawn-steel case with tough polyester plastic cover. It's the neat, high-efficiency, low-cost pressure transmitter for centralized operation or control. All standard ranges.

Write for complete details

THE FOXBORO COMPANY

607 Norfolk Street, Foxboro, Mass.

FOXBORO

REG. U.S. PAT. OFF.

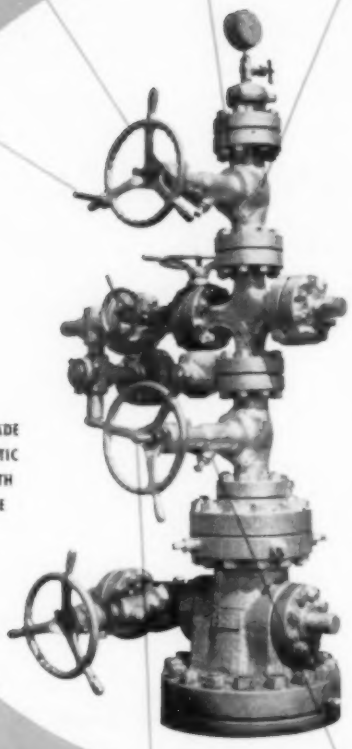
INSTRUMENTATION FOR INDUSTRY

FORGED STEEL BODY AND BONNET

NO LUBRICATION REQUIRED BELOW STEM PACKING

HELM TYPE HANDWHEEL

SPEED TYPE HANDLE FOR ALL VALVES



NO LUBRICATION REQUIRED FOR A POSITIVE SHUTOFF

SPECIALLY MADE PLIABLE PLASTIC PACKING WITH TEFLON BASE

RISING STEM

ACCESSIBLE PACKING ADJUSTING SCREW

Orbit's 6,000-10,000 lbs. Test Valves have been specially designed to give maximum trouble-free performance and low-cost maintenance under high pressure conditions.

why you should specify

Orbit forged steel valves

for high pressure

christmas trees....

Orbit forged steel valves for high pressure Christmas trees now are available through your favorite Well Head Manufacturer.

ORBIT VALVES ®

ORBIT VALVE COMPANY

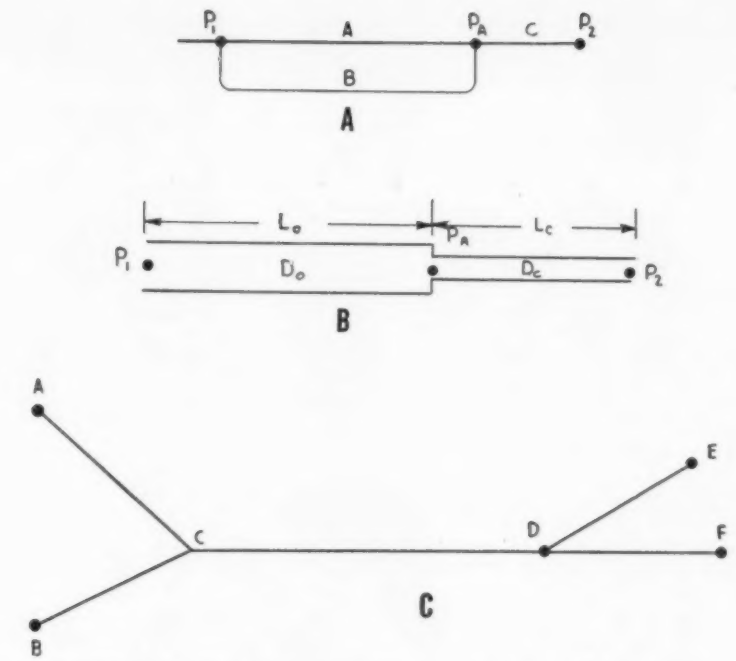
Box 699, LUther 4-4761, TWX TU 925

TULSA, OKLAHOMA

WAREHOUSES: HOUSTON, TEXAS, 407 Velasco, CApitol 8-6623, TWX HO 115; ODESSA, TEXAS, 402 West County Road, FEderal 7-2263, TWX ODESSA TEX 8041; CASPER, WYOMING, 247 West First St., Phone 3-5707, TWX CP 394; LONG BEACH, CALIFORNIA, 1425 West 15th Street, HEmlock 7-6206; EDMONTON, ALBERTA, CANADA, 7119-104th Street, Phone 391-283

CANADIAN REPRESENTATIVE: T. R. Pickford & Company, Ltd., Calgary, Alberta, 536 8th Avenue West, Phone 2-7371

EXPORT REPRESENTATIVE: New York 38, N. Y., 500 Fifth Ave., BRyant 9-2236



A SIMPLE LOOP SYSTEM is shown (A), the equivalent single line (B), and a branch system (C). Fig. 1.

Equivalent of loop . . . The flow characteristics of loop lines A and B may be expressed in terms of an equivalent single line of diameter D_o and L_o. This equivalent line is defined as a single line that has the same capacity as the loop system when the same pressure drop is imposed. If Equation 5 is written for each line and substituted into Equation 1, the K terms cancel and:

$$\frac{D_o^{8/3}}{L_o^{1/2}} = \frac{D_A^{8/3}}{L_A^{1/2}} + \frac{D_B^{8/3}}{L_B^{1/2}} \qquad (6)$$

If the lines are the same length, the denominators cancel. The loop system in Fig. 1a then reduces to the system shown in Fig. 1b. With reference to the latter figure,

$$Q_o = Q_C \text{ and } (\Delta P/L)_o\,(L_o) + (\Delta P/L)_e\,(L_e) = \text{Total } \Delta P \qquad (7)$$

This system could be solved, in the absence of knowing the pressure at P_A, by writing an equation for each section, equating them, and solving for P_A. With this value either of the equations may then be solved for the unknown quantity.

Equivalent of series . . . However, it is more convenient to express this system in terms of a single line that is equivalent to the two lines in series. This is done by finding what length of line D_o would be equivalent to L_e miles of diameter D_e, or vice versa. In this case equivalent means that both lines would have the same capacity with the same pressure drop. In general terms this may be found by writing Equation 5 for each line and substituting them into Equation 7. Then:

$$(D_1^{16/3}/L_1)^{1/2} = (D_2^{16/3}/L_2)^{1/2} \qquad (8)$$

and squaring both sides:

$$L_1 = L_2\,(D_1/D_2)^{16/3}$$
$$\text{or } D_1 = D_2\,(L_1/L_2)^{3/16} \qquad (9)$$

where L_1 = length of line of diameter D_1 that is equivalent to a line of diameter D_2 and length L_2.

Example: If in Fig. 1b, $D_o = 6$ in., $L_o = 10$ miles, $D_e = 8$ in., and $L_e = 20$ miles, determine the proper length and diameter of a single line that would be equivalent to the system shown.

Solution 1:

$$L_1 = 20\,(6/8)^{16/3} = \textbf{4.3 miles}$$
$$\text{Total length} = 10 + 4.3$$
$$= \textbf{14.3 miles of 6-in.}$$

Solution 2:

$$L_1 = 10\,(8/6)^{16/3} = \textbf{46.2 miles}$$
$$\text{Total length} = 20 + 46.2$$
$$= \textbf{66.2 miles of 8-in.}$$

This solution says 14.3 miles of 6-in. or 66.8 miles of 8-in. represents a single-line system that is equivalent to that shown in Fig. 1b. Consequently, the substitution of either combination of values into Equation 4 yields a solution for the loop system.

The solution of the branch line system shown in Fig. 1c must be basically solved by remembering that

$$Q_{BC} + Q_{AC} = Q_{CD} = Q_{DE} + Q_{DF} \qquad (10)$$

It is usually necessary to substitute the appropriate flow equation into this expression and solve for the unknown quantity. An example of this type of solution is shown in the Part 38, to follow.

Nomenclature

For lines in series:

- D_1 = diameter of line of length L_1 that is equivalent to a line of length L_2 and diameter D_2
- L_1 = length of line of diameter D_1 that is equivalent to a line of length L_2 and diameter D_2

For lines in parallel:

- D_o = diameter of a single line that is equivalent to a group of parallel lines
- D = diameter of the original line before looping
- D_1 = diameter of a single loop line (or equivalent diameter of a group of loop lines)
- D_2 = diameter of a second loop line in parallel with line D_1
- L_o = length of equivalent single line corresponding to D_o
- L_1 = length of loop line D_1
- L_2 = length of loop line D_2
- Q = original flow rate before line is looped
- Q_1 = flow rate after looping line
- X = fraction of length of original line that is looped

Technical progress in

Field Processing . . .

. . . is forming your job future. You need to keep pace with advances being made — developments which are outdating today's methods of operations, changing the pattern of tomorrow's job requirements.

You can be sure you're ready for your job future if you read The Oil and Gas Journal regularly. Each week the Journal brings you complete, but concise, details of the significant developments in technology and operations . . . information to increase your job knowledge and boost your job performance.

The Oil and Gas Journal

By W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

This department was created for the purpose of aiding managers, superintendents, engineers, chemists, and all those engaged in various phases of plant operation, as well as those connected with the marketing and utilization of petroleum products. Readers are invited to submit their problems to W. L. Nelson, technical editor. Inquiries must be signed, but only the initials will be printed.

Projection of Cost Indexes

Your Nelson Construction Cost Index in the January 7 issue is for August 1956. Can you bring this closer to date? Also, do you have information by which you can estimate your index until the end of 1957?—H.J.L.

The Quarterly Itemized Cost Indexes published in The Oil and Gas Journal (January, April, July, and October) lag ordinarily by 6 months because they are based to a large extent on U. S. Government statistics which sometimes cause such a delay.

The Nelson Refinery Construction Cost Index lags, however, by only 5 months, and it appears in the first issue each month. At the very best, the index could lag by only 2 or 3 months but the data at that time are only preliminary and almost invariably changes occur.

The Nelson Index was composed in a way that we hope causes it to lead price changes by a few months. This is accomplished by use of the basic cost of iron and steel as a basis rather than the cost of finished or fabricated steel machinery. When basic steel prices increase, the cost of finished steel does not rise for 1 or 2 months and the lag in the cost of machinery (Miscellaneous Equipment Indexes) is even greater. Thus, it is hoped that the Nelson Index indicates current conditions even though it is dated 4 or 5 months ago.

Projection of indexes . . . Although there is always a desire to forecast the future by means of indexes, such a use is usually highly speculative being based on the same controversial data (or more often opinions) as those underlying the economy of our society. Estimators must realize that the purpose of an index is to provide a method by which a number of cost quotations obtained at various dates can be brought to a common date for comparison or for the obtainment of the range of cost that may be encountered.

If projections or prophecies are undertaken, one can only look at the various variables one by one and decide how each may behave. Thus, in connection with the Nelson Index, the cost of steel is vital. Not only does it constitute much of the Material Component, but it is related or dependent upon wage increases. The cost of Miscellaneous Equipment (fabricated machinery, etc.) appears to lag behind basic steel prices by several months and in fact it never seems quite to catch up, possibly because of constant improvements in design and in management.

During 1957, we will probably experience a continued but somewhat smaller increase in labor costs than those encountered during recent years. Another increase in the cost of steel will occur during the summer but possibly tempered by current competitive conditions. Although it seems that an abnormal increase in the cost of fabricated equipment is due, this too may be tempered by competitive conditions and by the Government's supposed effort to halt inflation.

All of these factors indicate a rise in the Nelson Index to 207-209 by the end of 1957 which is an increase only slightly smaller than for last year and equal to the average since 1948:

	Increase over previous year (per cent)
1947	17.0
1948	13.2
1949	5.4
1950	4.7
1951	7.5
1952	4.1
1953	6.1
1954	3.6
1955	2.4
1956	6.0
1957	5.0

By April 1957, the Nelson Index had already passed 202. The index was plotted on page 261 of the January 28, 1957, issue.

Erdco Coker Test For Jet Fuels

What is the Erdco test for jet fuels? F.N.P.

The Erdco test rig or coker originally developed by Esso Research & Engineering Co. in an effort to duplicate the behavior of jet fuels in full-scale equipment, has recently been standardized as the C.F.R. Fuel Coker Test and the test is specified for JP-6 jet fuel (MIL-F-25656, USAF, September 10, and November 26, 1956). The C.F.R. (Coordinating Research Council) equipment consists essentially of a pump, a rotameter, a fuel heater, and a heated fuel filter. Pressure drop across the filter is measured in inches of mercury. Continuous operation is conducted at about 150 psi. In JP-6 specifications, the rate of flow is 6 lb. per hour, the preheater is operated at 400° F., and the filter at 500° F. A satisfactory fuel can undergo test for 5 hours without causing a pressure drop exceeding 10 in., or causing more than a light-tan deposit on the heater tank.

Correction: Cost of Polyethylene Plant

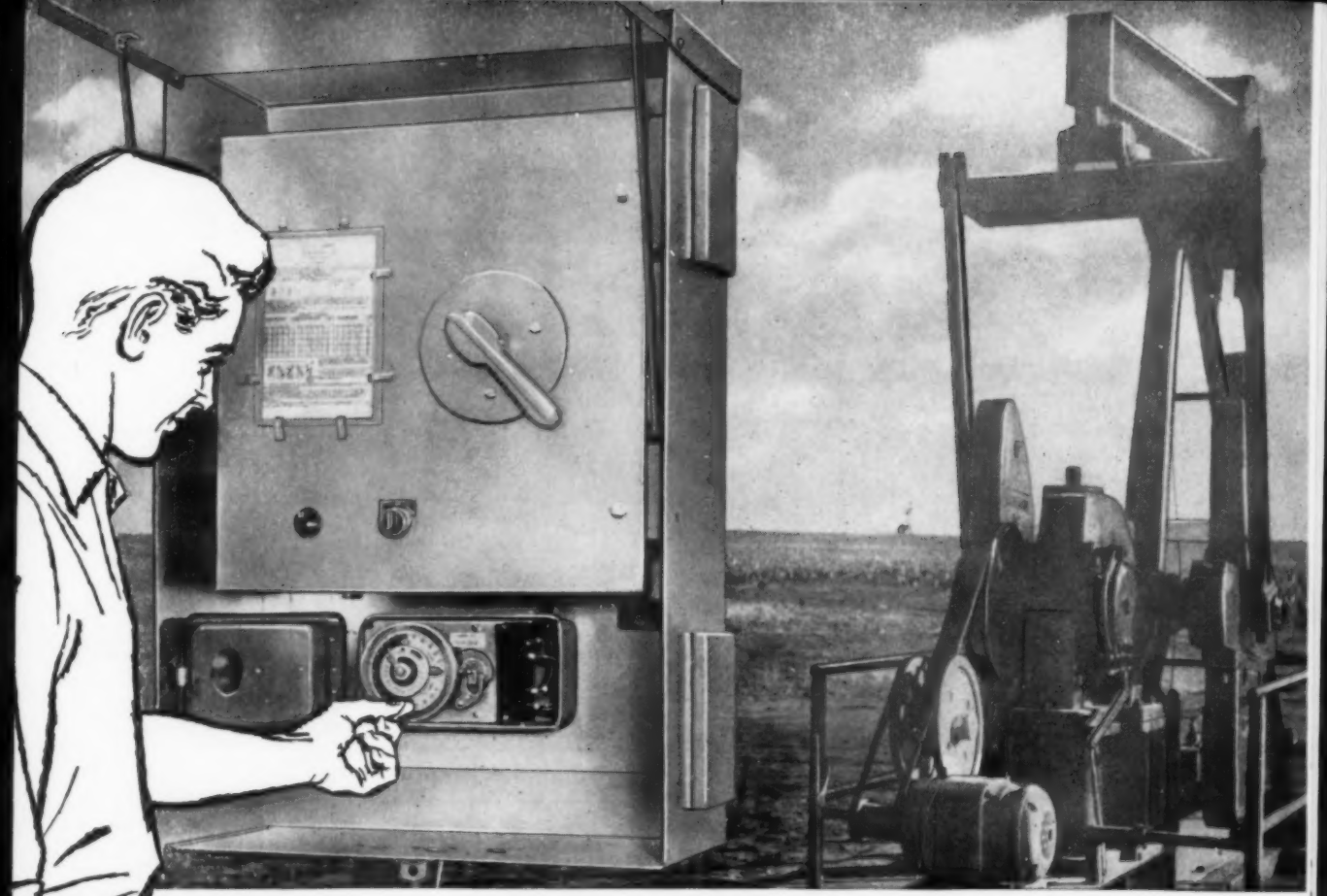
Will you check please on the cost of polyethylene plants shown in your COST-imating No. 30 of May 13, 1957? The cost seems high for such a large plant.—H.A.W.K.

This is unfortunately a decimal-point error, that is the cost per yearly ton should be $360 not $3,600. Information available to this department is not adequate for assessment of the effect of size. Only the following news release information is available.

Capacity (ton/yr.)	Cost, $ M.M.	Cost, $ M.M. 1946	1946, $ per yearly ton
50,000*	31.5 (1956)	16.5	344
30,000	36.0 (1953)	20.7	690
25,000	18.0 (1957)	9.1	364
22,500	15.0 (1953)	8.6	383
15,000	10.0 (1956)	5.3	354
6,000	(1951)		1,420

*Approximately 301,000 lb. per day.

Such news releases seldom disclose enough information to judge the difference between plants.



"Practically thinks for itself"

The new Cutler-Hammer Three-Star Oil Well Pumping Control has performed so successfully and proven so completely dependable that the leading oil field men everywhere insist on C-H control for all their pumping wells and accept no substitutes. Ask these men why and they will tell you, "That new C-H three-star control beats them all. No matter how tough it gets, our pumps keep pumping; and that Supertimer practically thinks for itself." Your first pumping well equipped with Cutler-Hammer control will prove to you what these men know . . . Cutler-Hammer Three-Star Oil Well Pumping Control will out-perform, out-protect, out-last and serve better than all others.

This control has *everything*, particularly the engineered dependability so vital in any automation . . . nothing is left to chance. Insist on the finest, insist on Cutler-Hammer . . . leading manufacturer of *automation* control.

Your nearby Authorized Cutler-Hammer Distributor is stocked and ready to serve you. Order from him today. CUTLER-HAMMER, Inc., 1453 St. Paul Avenue, Milwaukee 1, Wis. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.

Member American CUTLER-HAMMER ★ ★ ★ MOTOR CONTROL C-H *Petroleum Institute*

New CUTLER-HAMMER Supertimer

This is *automation* in action. You pre-set the Supertimer to meet your field allowable and the control will do the rest, automatically. It starts, stops, restarts and cycles indefinitely, precisely according to your schedule. If a power outage occurs, any number of C-H controlled pumps can be restarted in an exact sequence to avoid overloading the power lines on inrush. Unfortunate coincidental starting of even two pumps is impossible.

A Sets the precise restarting time delay from zero to 180 seconds. This is exclusive with the Supertimer—random starts or coincidental starts of even two pumps are impossible.

B Sets the daily pumping schedule—pull a tab for each fifteen minutes of pumping, space them through the daily 24 hour period as desired.

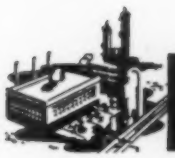
C Sets the weekly pumping schedule—1, 2, 3, 4, 5, 6 or 7 days per week as desired.

COMPLETE PROTECTION
The control is protected against lightning with exclusive, advanced-designed lightning arresters; and the three coil overload relay protects the pump motor from overloading and dangerous single phasing which often results from lightning.

CHIMNEY DRAFT VENTILATION
The heat-reflecting, aluminized enclosure insures a constant circulation of air . . . no nuisance tripping because of trapped heat.

DUST SAFE CONTACTS
Dust-Safe vertical contacts stay clean and eliminate the necessity of contact replacement common to other designs.

Part 1
of a new series



THE FOREMAN'S PAGE

Refining • Petrochem • Natural Gasoline

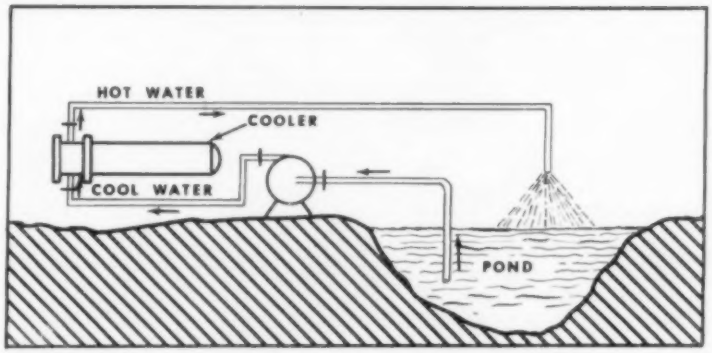
JOB IMPROVEMENT FOR THE PROCESS FOREMAN—96

How Cooling Towers Were Developed

REFINERIES have the problem of producing large quantities of water for cooling purposes. The three major water streams used for cooling are: (1) river water, (2) well water, and (3) cooling-tower water.

Of the three types of water used for cooling purposes, refrigeration plays a part in the operation of cooling towers. We usually do not think of a cooling tower as being a refrigerating unit but it is. And it depends upon the evaporation principle of refrigeration for its operation.

Cooling of water for industrial purposes was obtained first by allowing it to flow into an open place, for example, on the surface of a pond, simply exposing it to the air (Fig. 1).



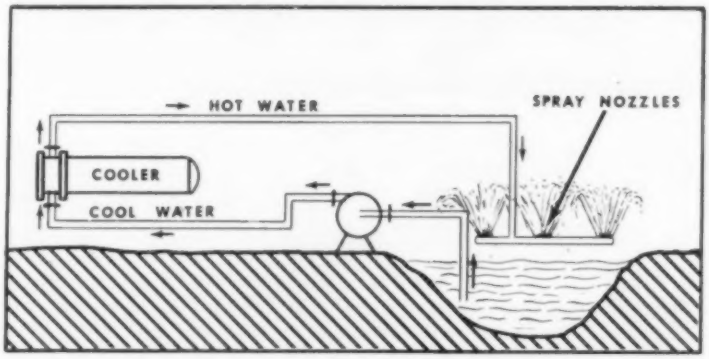
OPEN-POND cooling system was an early method of cooling. Fig. 1.

Spray pond . . . By 1920 the spray pond was the system generally in use (Fig. 2). The water was sprayed into the air to break it up into smaller particles, by discharging it through spray nozzles. The water issuing from the nozzle creates a draft which aided by the natural breeze, effects the necessary evaporation.

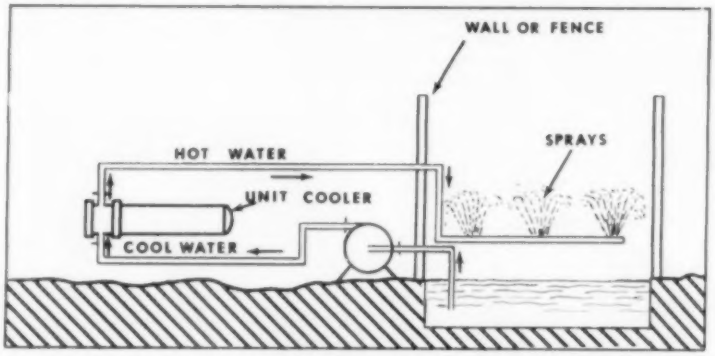
Obviously, the spray pond was an improvement over the straight pond type. However, objections to the method were its low cooling capacity and high water losses, which included deposition of droplets on neighboring buildings, walks, and streets.

Operators of spray ponds found that in periods of just average wind conditions the loss of water that was blown away in droplet form amounted to 5 to 10 per cent of the water circulated. This was expensive in water cost, and often damaging to nearby property and equipment. The result was the installation of fences around the pond, thus, the spray type of cooler was developed (Fig. 3).

The first natural-draft type of cooling towers were built in 1920-30.



SPRAY-POND cooling system has low cooling capacity. Fig. 2.



SPRAY type of cooler included a wall or high fence. Fig. 3.

These cooling towers are often called atmospheric type of towers. After a time the forced-draft and induced-draft towers were developed. Spray-pond type of cooling does not play a major part in refinery cooling since it requires about 50 times as much area as a cooling tower. The natural-pond type of cooling system is an even poorer system. It requires about 1,000 times as much area as a conventional cooling tower.

Material taken from process-training-program manual, Baton Rouge, La., refinery of Esso-Standard Oil Co.

IS A METAL DEACTIVATOR WORTH WHILE?

TENAMENE 60 pays off in case after case

Eastman Copper Chelating Additive

- **Inhibits gum formation in motor gasoline**
- **Stops color degradation in kerosene**
- **Reduces fuel oil clogging**
- **Improves stability of jet fuel**

Even trace amounts of copper can be extremely harmful to most petroleum products.

Eastman's metal deactivator, Tenamene 60, used in amounts from 2 to 6 pounds per 1,000 barrels, protects most petroleum products in storage and during use from the detrimental effects of copper-catalyzed oxidation reactions. A chelating agent, Tenamene 60 ties up the copper to form a non-reactive, non-catalytic compound.

Gasoline

Copper has a powerful pro-oxidant effect on gasoline and catalyzes normal gum-forming reactions. Its presence requires an excessive amount of antioxidant to obtain a satisfactory induction period. A more effective and a more economical method is to use Tenamene 60 in conjunction with a normal amount of antioxidant.

Refiners need Tenamene 60 for adequate protection of motor and aviation gasolines. The increased use of catalytically cracked stocks makes storage a particularly troublesome problem because such stocks are more susceptible to oxidation and, hence, to the catalytic action of copper. The test data shown in the accompanying table demonstrate the beneficial results obtained from the use of Tenamene 60 in a blended gasoline containing approximately 45% catalytically and thermally cracked stocks.

Effectiveness of Tenamene 60 in Protecting Gasoline

Sample	Induction Period	Peroxide Number	ASTM Gum	Copper Dish Gum
Unprotected Gasoline				
Initial	330	0.1	3.1	4.0
After 20 weeks at 110°F	—	30+	116+	575+
Gasoline protected with Tenamene 60*				
Initial	780	0.1	3.1	4.0
After 20 weeks at 110°F	—	1.0	4.6	8.0

*2 lbs. per 1,000 bbls.

Alchemist's symbol for copper

Kerosene

When kerosene is copper-sweetened or contains dissolved copper from other sources, color degradation frequently occurs due to the catalytic action of the copper. The Saybolt color value of a typical untreated kerosene containing copper, heated for 24 hours at 212°F, changed from 25 to 14. Protected by just 2 pounds of Tenamene 60/1,000 barrels, the Saybolt color value of this same kerosene changed hardly at all...from 25 to 24.

Diesel and Home Heating Fuel

Two problems exist in the storage and use of diesel and home heating fuels. One is formation of copper-mercaptide, a waxy, jelly-like substance, on brass screens, nozzles and filters. The second is formation of an organic gum-like material that binds sludge. Tenamene 60 helps solve both problems by retarding the catalytic action of copper promoting these reactions.

Jet Fuels

Test results using a CFR fuel Coker* instrument show the addition of a small amount of Tenamene 60 increases significantly the stability of JR-4 fuel at high temperature by reducing sludge formation. Tenamene 60 is approved and widely accepted for use in this type of fuel.

Tenamene 60 also should be evaluated as a means to improve the stability and performance of *turbine oils, bearing greases, hydraulic fluids* and *lubricants* subject to copper-catalyzed oxidation.

In case after case, use of Tenamene 60 insures optimum performance of gasoline, fuel oil, kerosene, jet fuels ...especially following prolonged storage.

Investigate the protection Tenamene 60 can bring your refinery products. For more information, write to EASTMAN CHEMICAL PRODUCTS, INC., a subsidiary of EASTMAN KODAK COMPANY, Kingsport, Tennessee.

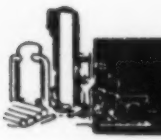
*The CFR fuel Coker instrument (ERDCO rig) measures the rate at which pressure develops as heated fuel is recirculated through a filter screen. Test results are relative and are given as "fuel goodness ratings."

Tenamene 60

EASTMAN METAL DEACTIVATOR

SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tennessee; New York City; Framingham, Mass.; Cincinnati; Cleveland; Chicago; St. Louis; Houston. **West Coast: Wilson Meyer Co.,** San Francisco; Los Angeles; Portland; Salt Lake City; Seattle; Denver; Spokane; Phoenix.

By J. G. Burnham
Stearns-Roger Manufacturing Co.



FIELD PROCESSING
NATURAL GASOLINE . . . REFINING

Nitrogen Removal **Part 2**

Economics of Nitrogen-Removal Plants

THE gas volumes, percentage of nitrogen extracted, upgrading of heating value, investment, and daily income and expense for the three plants designed were listed in Part 1, Table 1 of this series which appeared in the July 8 issue of The Oil and Gas Journal.

Plant designs . . . The three plant designs were for major pipeline-transmission companies operating in Kansas, Oklahoma, and New Mexico, and elsewhere. The raw-gas content varied from 16 to 27 per cent nitrogen, and from 700 to above 900 B.t.u. per cu. ft. in heating value.

Investment

In arriving at the capital investment for each of these cases, only the component parts of the plant were considered which were necessary to the operation of nitrogen removal. The carbon dioxide-removal unit, the hydrocarbon-recovery unit, the fractionation facilities, storage, low-temperature refrigeration and fractionation, recompressors, and a proportionate share of the utilities were considered to be the nitrogen-removal system. Any compressor horsepower to recover pressure drop through the process also was considered a part. The dehydration unit and horsepower for boosting to the sales line pressure were not deemed necessary. They would have been required even if the nitrogen was not removed.

Plants 1 and 2 were designed about 7 or 8 years ago and Plant 3 not quite 2 years ago. The economics for Plants 1 and 2 were much better 7 years ago than it appears they are now. Seven years ago product prices of 6¾ cents for natural and 4¼ cents for propane and butane were used. Capital costs were a little more than half of the amounts shown in Table 1. These two factors would have a healthy influence on any plant payout.

The information in Table 1 was prepared on the premise that the residue gas did not increase in value by removing the nitrogen and other inerts. Regulatory bodies probably would view a nitrogen plant very much as they would a treating plant or a dehydration plant and accordingly would frown upon attempts at appreciation, nor would they permit accelerated amortization.

Investment figures . . . The investment and product prices have been revised to reflect current costs. The investment figures should not be assumed as a par or standard. Any attempt to develop a rule of thumb as to cost of removal of nitrogen such as dollars per thousand or million may be misleading.

Each plant should be designed and estimated without too much reference to previous work that has been done. Cost figures can change sharply from one location to another because of difference in a company's construction standards, requirements, amount of convertible or usable machinery already available, or labor conditions, etc.

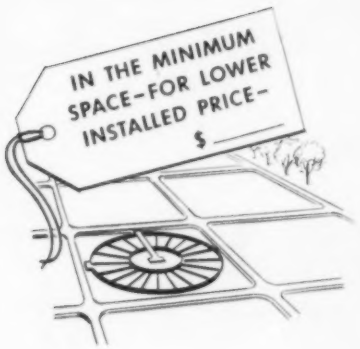
Plants 1A and 1B are the same location and are used for the same raw gas. We tried figuring these two cases to determine the effect of the degree of nitrogen extraction upon the plant cost. Plant 1A is a case of the minimum nitrogen removal producing a residue which would meet the allowable heating value. Plant 1B is a case for about the maximum amount of nitrogen extraction that is was practical to design.

Using today's prices only Plant 1A shows a daily operating profit; the others never get off the ground. Plant 1A cannot produce sufficient revenue to cover amortization, and even if amortization is ignored, the payout is too long to be given a second look.

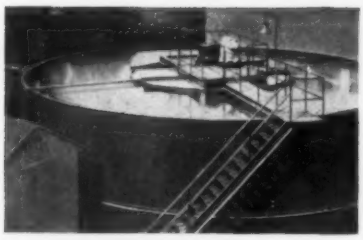
Table 2 is a rearrangement of Table 1 using only Plants 1A and 1B. The other two cases have been eliminated as they do not develop a daily operating profit and are, therefore, valueless as examples. Table 1 shows the price that would be necessary to be paid for raw gas in order to produce a 5-year payout. Another way of viewing the table is, it shows the differential required between the cost of raw gas and sales gas needed for a 5-year payout. For Plant 1A the raw gas price would be 7.2 cents per thousand cubic feet or a differential of 12.8 cents per thousand cubic feet. For Plant 1B the raw gas price would be 3.5 cents per thousand cubic feet or a differential of 16.5 cents per thousand cubic feet. Naturally these prices are not realistic in terms of the present. Any company buying or selling gas at these raw gas prices today is very obviously buying distress gas.

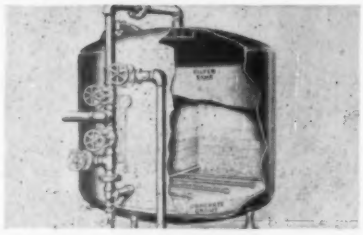
TABLE 2

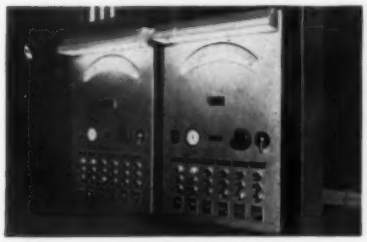
	Plant 1A	Plant 1B
Capital investment	$16,800,000	$19,100,000
Total yearly income	8,349,010	7,795,305
Total yearly expenses exclusive of raw-gas cost	730,730	854,830
Yearly fixed charges	1,624,000	1,846,100
Gross operating profit per day for 5-year payout	13,655	15,523
Raw-gas cost per M.c.f. for 5-year payout, cents	7.2	3.5



You get dependable performance for all types of brine and water treatment with INFILCO equipment







ACCELATOR®

plants for clarification, softening and stabilization

Effective mixing of chemicals and raw water with recirculating slurry and downflow separation effect better treatment in minimum area — and at low cost. For water, brine or waste treatment.

BULLETIN 1825

CHEMICAL FEEDERS

Accurately controlled feed rates and maximum economy

Compact designs for automatic or manual control, for all types of chemicals. Type E Feeders dispense dry chemicals volumetrically, from bulk storage to dry or wet applications. BULLETIN 215

NEUSOL® FEEDERS

Wide feed range, corrosion resistant construction adapt this versatile and dependable displacement feeder to most chemical solution requirements.

BULLETIN 340

AERATORS and DEGASIFIERS

For all types of gas-liquid transfer applications. Efficient oxidation, carbon dioxide and hydrogen sulfide removal.

BULLETIN 106

Request information on recarbonators, deaerating heaters and vacuum degasifiers.

PRESSURE FILTERS

Standard or special construction for the most exacting process requirements

Vertical or horizontal, sand or anthracite types with manual or automatic controls for water or brine filtration. BULLETIN 1520

The STELLAR® diatomite filter, with its exclusive "gas-bump" cleaning is standard for amine solutions in most of the largest gas companies. BULLETIN 1560

MODERN INSTRUMENTATION

Maintains efficiency, reduces operating cost of treatment

Design and assembly of pneumatic, electric or hydraulic control components for manual or automatic, constant or variable rate plants. Operating consoles and control panels specifically engineered for complete treating plants. BULLETIN 1100

INFILCO

INFILCO
INCORPORATED
General Offices · Tucson, Arizona · P.O. Box 5033
Field offices throughout the United States and in foreign countries

57402

INFILCO CAN help you solve any water and brine treatment problem in oil production and refining

From experience, extending over 60 years, INFILCO can give you the best results with lowest *first* cost and *operating* costs.

No other line of equipment is so complete—none so advanced in method and design. Above are a few examples.

It will pay you to investigate. Inquiries are invited on all matters relating to water or brine treatment. Write today for new condensed catalog, Bulletin 80, for a more complete description of INFILCO products.

THE ONLY COMPANY impartially offering equipment for ALL types of water and waste processing—coagulation, precipitation, sedimentation, flotation, filtration, ion exchange and biological treatment.

By Robert L. McIntire
The Datics Corp.

EXPLORATION · · · DRILLING · · · PRODUCTION · · · PIPELINE · · · REFINING

PETROdatics
ELECTRONIC COMPUTERS

Using Electronic Computers in the Oil Industry Part 14

How Machines Handle Complicated K Charts

AN earlier PETROdatics article[1] indicated how simple K values could be approximated and reproduced within a larger machine calculation. In this case, the K value was assumed to be a function of temperature or pressure alone. The method usually chosen to fit the data of this simple nature is by use of a polynomial or an Antoine type of equation.

In many cases, the phase calculations to be performed must also take into account pressure, temperature, and some prescribed composition parameter simultaneously. Many attempts at simplification by graphical correlation have been published.[2,3,4,5]

Each of these graphical means of obtaining engineering estimates has the disadvantages associated with the reading of large numbers of charts and the interpolations. Even a simple bubble-point calculation becomes laborious and time consuming.

Recently at least three different laboratories have made substantial contributions toward applying this problem to the automatic computer. In one instance, the K values of 42 hydrocarbons normally occurring in a gasoline-plant operation were tabulated using experimental data and the correlations of Hougen and Watson.[6] One computer manufacturer[7] recently coded a routine for calculating K values using the data in the new charts of the Natural Gasoline Association of America. This procedure is now being incorporated into a general-purpose fractionator design program which shows real promise of being the best yet developed.[8]

All of these procedures involve the condensation of the graphical information into a set or sets of constants. Typical of this condensation are the constants recently presented at the Seattle meeting of the American Institute of Chemical Engineers. These authors[9] used the correlation developed by Edmister and Ruby as their basic data and developed the constants in Equation 1.

$$\Psi = a_o + a_1f_1 + a_2f_1^2 + a_3f_1^3 + a_4f_2 + a_5f_3 + a_6f_1f_3 + a_7f_1^2f_3 + a_8f_1^3f_3 + a_9f_2f_3 + a_{10}f_3^2 + a_{11}f_1f_3^2 + a_{12}f_1^2f_3^2 + a_{13}f_1^3f_3^2 + a_{14}f_2f_3^2 + a_{15}f_4 + a_{16}f_1f_4 + a_{17}f_1^2f_4 + a_{18}f_1^3f_4 + a_{19}f_2f_4 \quad (1)$$

This equation is completely generalized. By assigning different definitions to the dependent variable, Ψ, and the independent variables f_1, f_2, f_3, and f_4, each of the charts developed by Edmister and Ruby can be stored inside a computer.

The complete set of these constants is given in the reference paper. All of these constants could be stored in only 182 memory cells in the computer. The associated coding necessary to use the constants would require about 200 cells also. This total memory requirement represents between 10 and 20 per cent of the entire memory available in medium-size machines.

For example, if the critical properties of a component or the pseudocritical properties of a mixture are known, the computer can calculate the reduced pressure and temperature. Using the regression coefficients of Equation 1, the computer can calculate the gas-phase activity coefficient.

The machine correlation promises only to reproduce the graphical correlation with no significant differences. If the design engineer is prepared to use the smoothed data of Edmister and Ruby, M. W. Kellogg, N.G.A.A., or Hougen and Watson, that same data is now available for machine calculations.

References

1. McIntire, Robert L., PETROdatics No. 5, The Oil and Gas Journal, March 4, 1957.
2. Equilibrium Ratio Data Book, 1955, Natural Gasoline Association of America.
3. Liquid-Vapor Equilibrium in Mixture of Light Hydrocarbons, 1950, M. W. Kellogg Co., Technical Data Book.
4. Edmister and Ruby, "Generalized Activity Coefficients of Hydrocarbon Mixture Components," Chemical Engineering Progress, 51, 95-100, February 1955.
5. Hougen and Watson, Chemical Process Principles, Part 2, Thermodynamics, New York, John Wiley & Sons, 1947.
6. Driscoll, M. J., private communication.
7. Franklin, J., Burroughs Corp., Pasadena, Calif.
8. Private communication with a California design firm.
9. Goodwill, Gordon, and Paylor, Machine Computation of K-Values, Seattle meeting, A.I.Ch.E., 1957.

Where to Find Parts 1 Through 13 . . .

PART 1—How Electronic Computers Operate, January 7, page 129.
PART 2—Block Diagram Acts as Problem Flow Chart, January 21, page 118.
PART 3—Computers Introduce Unique Language, February 4, page 135.
PART 4—What Scientific Data Reduction Includes, February 18, page 175.
PART 5—Organizing Design Data, March 4, page 122.
PART 6—Solving the Compressibility Factor, March 18, page 153.
PART 7—How to Determine Density Values, April 8, page 123.
PART 8—How to Calculate the Theoretical Tray, April 15, page 136.
PART 9—Fractionator Theoretical Tray Calculation, May 6, page 141.
PART 10—How the Mass Spectrometer Works, May 20, page 203.
PART 11—Isothermal Flash Calculations, May 27, page 158.
PART 12—Stored-Program Computations of Gravity Data, June 10, page 125.
PART 13—Calculating Flash Temepratures, July 1, page 153.

For Shell Oil Co....

SIX CAT* ELECTRIC SETS POWER THE FIRST DIESEL-ELECTRIC, TRAILER-MOUNTED DRILL RIG

Shell Oil Co. has put a revolutionary new drilling rig to work in the Julesburg basin of Nebraska and northeast Colorado. It's the first rig to combine the flexibility of diesel-electric power and the portability of trailer-mounted components. The basic drilling unit—power, drawworks, rig—is mounted on three trailers.

Power is provided by six Caterpillar Electric Sets, mounted on a specially built trailer. Four D337 and two D318 Electric Sets produce a total of 720 KW for the entire operation. Because the power is delivered through 100-foot lengths of cable rather than through a mechanical drive, the power trailer can be located anywhere in the drilling site, instead of being accurately aligned. As a result of this and other time-saving operations, the rig can be set up and taken down at least one day faster than the conventional rig it replaces. Based on an average of 30 moves annually, the new rig will be able to drill one month more each year.

The four Cat D337 Electric Sets are coupled to General Electric flange-mounted, single-bearing generators to provide power for the Ideco rig. Each of the D318s is coupled to a 25 KW DC and a 30 KW, 3-phase, 60-cycle AC generator supplying DC excitation for the prime generators and AC power to air compressor, washdown pump, shale shaker, blowout preventer closing unit, rig lights and drillers' doghouse lights. One of the above D318s provides 100 per cent standby capacity.

Diesel-electric rigs—first used offshore—now are spreading to land applications. In this development, as in others, men in oil patches throughout the world look to their Caterpillar Dealers for the engines and electric sets which have proved their dependability and high production for a quarter century.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

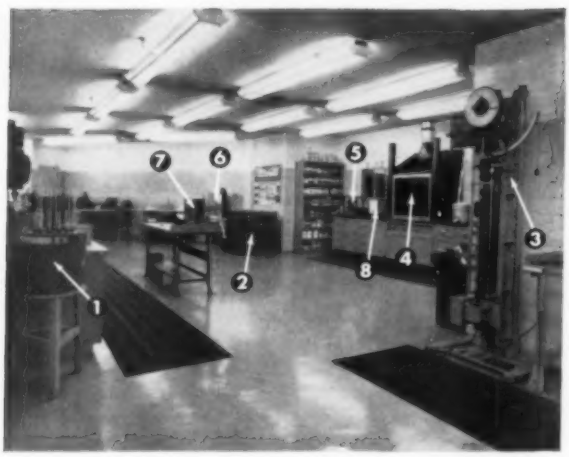
*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

A QUARTER CENTURY OF DIESEL LEADERSHIP

1. Insulation Test Equipment
2. Dielectric Test Equipment

1. Sub-Zero Cabinet
2. Air Permeability Apparatus
3. Zipper Seal Test Tank
4. Analytical Balance

MALONEY MAINTAINS PRECISE CONTROL



1. Comet Aging Block
2. Sub-Zero Cabinet
3. Scott Tester
4. Oil Immersion Apparatus
5. Gravimeter
6. Air Permeability Apparatus
7. High Powered Microscope
8. Drying Oven

These pictures of our newly expanded Research and Development Laboratory will give you some idea of why F. H. Maloney Company for 25 years has had the reputation for "Precision in Rubber—Metals—Plastics." It is the largest and most complete laboratory of its type in the Southwest. Mr. A. S. (Tony) Girala, Chief Development Engineer, who has been with our organization for 20 years, heads up this laboratory and a staff of experienced technicians and research chemists.

This Laboratory is available to our customers for Testing, Research, Development, and Specification-compounding.

While this Laboratory is completely air-conditioned and all testing is done under controlled atmospheric conditions, adjoining this Laboratory is a complete Pilot Plant capable of producing specification rubber under atmospheric conditions, duplicating the conditions that prevail in our rubber manufacturing plants. This Pilot Plant is also under the direct supervision of Mr. Girala.

"Something from the Irishman"

F. H. MALONEY Company

Houston, Texas

2301 TEXAS AVE. • FA 3-3161 • HOUSTON

LOS ANGELES • TULSA • OLEAN, N. Y.

SINCE 1932—PRECISION IN RUBBER—METAL—PLASTICS

A 10-MINUTE JOURNAL FEATURE

Better Management

Try this test. Find out if you are a

GOALS AND OBJECTIVES	Generally YES	Frequently NO
Are department goals clear to me?	☐	☐
Are employe performance standards so set that most decisions are routine?	☐	☐
Are objectives carefully considered in making decisions?	☐	☐

THE PROBLEM AND THE FACTS	Generally YES	Frequently NO
Do I dig beneath the apparent "surface" problem?	☐	☐
Do I recognize my own shortcomings, as part of some problems?	☐	☐
Does my method of question-asking get effective response from employes?	☐	☐

Skill in making sound decisions really involves the effective use of a number of fundamental management skills. Different skills are used in each of the basic steps which are followed in making a decision.

As you think about the skills discussed here, decide in which of these skills you are the strongest, in which the weakest. Then use the practice techniques to improve your weaker skills, to improve your over-all decision-making ability.

How Would You?

To start with, please consider how **you** would make decisions on such typical problems as these:

- Whether to discharge or discipline an employe?
- Should a given piece of equipment be purchased?
- Which employe should be selected for promotion?
- Whether a certain quality-improving method should be adopted?
- Should a supervisor carry out a policy with which he disagrees or recommend a change in the policy?
- Should a supervisor telephone, write a memo, or deliver an idea by face-to-face discussion?

Decisions All Day Long

If you think back over the work day, you can probably recall five or six important decisions you had to make. In fact, a supervisor makes many more than that —possibly over 50 decisions a day. This number may sound high, but it includes decisions of a wide variety and type. And each one affects the performance of the operations he supervises.

- **People or Things.** Some decisions primarily concern people. Other decisions concern things. Of course, most decisions are a combination of both.
- **Self or Others.** We generally think of decisions involving other people. But equally important are decisions made on the job regarding oneself. For instance, whether to spend 2 hours, or a half-hour, on a particular problem, may be an important decision.
- **Big or Little.** The big decisions are easily remembered. The little ones are frequently not even thought of as "decisions." Yet, the decisions to correct an employe, to assign one piece of work ahead of another, to recommend action to the boss may be little decisions having a big effect on performance.

On the job, remember—**every time you make a choice, every time you take action, you have made a decision.** Big or little, each decision is an important factor in your managerial effectiveness.

The Decision-Making Process

To understand the decision-making process is not easy. It is characterized by a number of seeming contradictions:

- Decisions should be based on facts. But frequently not **all** the facts are available.
- In making decisions, it's important to be objective, unbiased, unemotional. Yet, sound decisions are based on an accurate analysis of other people's emotions and reactions.
- Decisions become precedents for future decisions. But any decision must be based, in part, on previous decisions.
- A decision always involves risk. But **no decision** also involves risk.

Yes, the decision-making process is complex. But not so complicated that we cannot master it.

TIPS ON DEC

good decision maker . . . The problem? . . . Finding th

	Generally YES	Frequently NO
Is the amount of time I spend gathering facts about right?	☐	☐
MAKING DECISIONS		
Do I attempt to consider many alternatives?	☐	☐
Are my decisions accepted without serious objections?	☐	☐
Is action based on decisions taken promptly?	☐	☐
GENERAL		
• **Are my on-the-spot decisions consistent with other similar decisions?**	☐	☐
• **Do my "larger" decisions receive full and thorough analysis?**	☐	☐

The over-all skill to make sound decisions involves the combination of many, varied specific skills. Setting practical objectives requires the ability to plan ahead and anticipate operational needs. Getting the facts demands concentration and efficiency in utilizing valuable time. Selecting the right decision requires basic intelligence in balancing a number of "unlike" facts. But, the greatest skill is to know when a decision can be made on the spot, and when one must think first.

How to Develop Decision-Making Skills

STEP 1—SETTING PRACTICAL GOALS

Every decision is based on some goal or objective—whether known to all employes, or whether a goal only in the mind of the decision maker. It is of primary importance that goals be clear and attainable. Otherwise, individual decisions will seem vague and indefinite to employes, and several taken together may seem unfair.

Skills required . . . 1. Ability **to interpret** top-management decisions, which really form the basic goals for your activities or operations.

2. Ability **to translate** management goals into departmental job objectives. These fall naturally into two areas. First, over-all quotas, expressed in dollars, barrels, or other figures. Second, standards of performance for employes, including those human relations practices and attitudes you desire.

Practice techniques. . . . When you have time to yourself, use a pencil and paper on the following practice steps:

1. Write down 6 to 10 departmental goals, some of which are quotas and some of which are performance standards for employes.

2. Next, jot down specific decisions you have made to attain each goal.

3. Then, rate your progress to date on these goals. Starting with "1," indicate in order where progress has been greatest.

4. Now look over your rating. Necessary areas for decision and action will quickly come to mind.

Guiding principle . . . All too many decisions are made under "crisis" conditions. By setting practical goals, decisions can be made in advance of "trouble." Furthermore, with these goals strongly in mind, decisions which block progress will be prevented.

STEP 2—RECOGNIZING THE PROBLEM

Recognizing the real problem—not just grabbing what may be the "surface" problem—is the core of decision making. Finding that problem will lead logically to the required facts. And a good job of fact-finding usually, but not always, points the way to the best decision.

Skills required . . . 1. Capacity for acute observation and alertness to conditions that indicate possible problems in advance.

2. Ability to formulate a clear statement of the basic problem in one's own mind.

3. Power to concentrate and stubbornly track down facts. The question-asking process requires "toughness"—not toward people—with respect to accuracy of information.

Practice techniques . . . Two practice drills are suggested. Written or mental, each should become a permanent part of your approach to every decision.

CISION MAKING

the facts? . . . Course of action?

	Generally YES	Frequently NO
• Do I make use of staff personnel to assist in facts and evaluation?	☐	☐
• Do I make decisions which are my responsibility, without passing them up the line?	☐	☐

	Generally YES	Frequently NO
• Do I like to make decisions?	☐	☐

Look over your answers. They will reveal specific areas which need the most effort. Regardless of how well you rate yourself, go back and try, at least once, each Practice Technique suggested in the Managerial Skill Study.

We've all heard someone say, "I don't mind my job—it's just all those decisions I've got to make." Actually, it is the way in which a supervisor reaches his many decisions, minute-by-minute and day-by-day, that makes his job pleasant or nerve-racking, easy or hard, a success or a failure. The purpose of this managerial skill study is to help the supervisor improve his own ability in a most important area of managerial ability.

1. Select a problem you presently have, one on which no decision has yet been made. Before getting the facts, list what facts you feel you need, without prejudging whether you can get them or not.

Note how many facts you have listed. How many might you have forgotten, had you plunged into the fact-finding step without a few minutes of planning?

2 Now, proceed to get all the availab!e facts. Then, write down those facts you don't have, which you feel you need. Next to each important missing fact, write down the best assumption you can make. Exploring these facts and assumptions gives a basis for decision making.

Guiding principle . . . Use judgment in determining the right amount of time to spend on fact gathering. Learn to preplan the prob!em-recognition and fact-finding step. Such planning will lead to an over-all grasp of the situation, and prevent "missing the point."

STEP 3—DECISION AND ACTION

Decision making is more than merely adding up advantages and disadvantages. More often than not, decisions are the consideration of "unlike" elements, such as cost saving on the one hand, versus employe attitude on the other.

Practically speaking, decision making is a "process of elimination" of alternatives, each of which may have some degree of merit.

Skills required . . . 1. Keen insight into how peop!e and things work, plus intelligent foresight into how people and things will react to change.

2. Open-mindedness in approaching the main alternative actions that present themselves. Seldom does only one feasible solution far outweigh all others.

3. A good sense of timing action. The decision which was sound a week ago may not be the decision that is advisable today.

Practice techniques . . . Some people spend too long mulling over many alternatives. But more common is the tendency to jump to a conclusion or quickly close the mind to all but one alternative. Practice the following technique whenever possible.

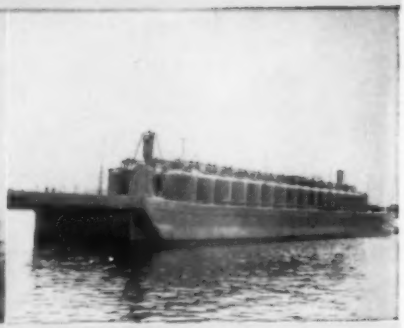
Put down on paper all the possible alternate decisions to a problem, without evaluating them in advance. "Brainstorm" the problem, attempting to see how many courses of action you can find. Later, come back and make a decision.

Guiding principle . . . Selecting a course of action requires all the intelligence and experience we can muster. Sound, effective decisions rarely come off the "top of the head." They come from hard, careful thought, whether they are made quickly or slowly.

This report prepared by and published through the courtesy of Elliott Service Co., Inc., 30 N. MacQuesten Parkway, Mount Vernon, N. Y.

Whatever you need...

If you need it right on time...



Get hold of Higgins INC.

Box 8001 —
New Orleans 22, La.

DRILLING BARGES • DREDGES • BARGES
QUARTER BOATS • TUGS • WORK BOATS
COMMUNICATION CRAFT • TANK BARGES
DRILLING STRUCTURES • PLEASURE BOATS
STEEL FABRICATION • PERSONNEL BOATS
SEISMOGRAPH BOATS • BULK-TYPE CARGO
BARGES • MARINE REPAIRS OF ALL TYPES

NOW

a new STEAM valve with all the Rockwood Ball Valve advantages!

The new Rockwood Bronze Ball Valve for use with steam offers you many unusual benefits.

It Handles up to 125 Pounds of Steam per square inch and 350°F, with ease.

It's Leakproof — even after continued use Rockwood Steam Ball Valves stay dry.

It Opens and Closes Quickly — only a quarter turn is needed to open or close Rockwood Ball Valves.

It Has Longer Wear-Resistance — chrome-plated bronze ball withstands abrasion, scratching and pitting.

Rockwood's new Ball Valve for use with steam comes in pipe sizes from ¾″ up to 2″. Send coupon for full information and data. Distributors in all principal industrial areas.

ROCKWOOD BALL VALVES

FULL, ROUND FLOW

ROCKWOOD

ROCKWOOD SPRINKLER COMPANY
2202 Harlow Street
Worcester 5, Mass.

Send me illustrated folder on Rockwood's new Ball Valve for use with steam.

Name.....

Title.....

Company.....

City.....Zone..State.....

PIPELINERS

R.H.FULTON & CO.
CONTRACTORS
LUBBOCK, TEXAS

TEMPORARY BRIDGE supports the 14-in. pipeline across Cava Monasterello. Mountain grades of 60° to 70° slowed the job.

Solid rock, steep grades, and 19-ft. right-of-way force Gulf . . .

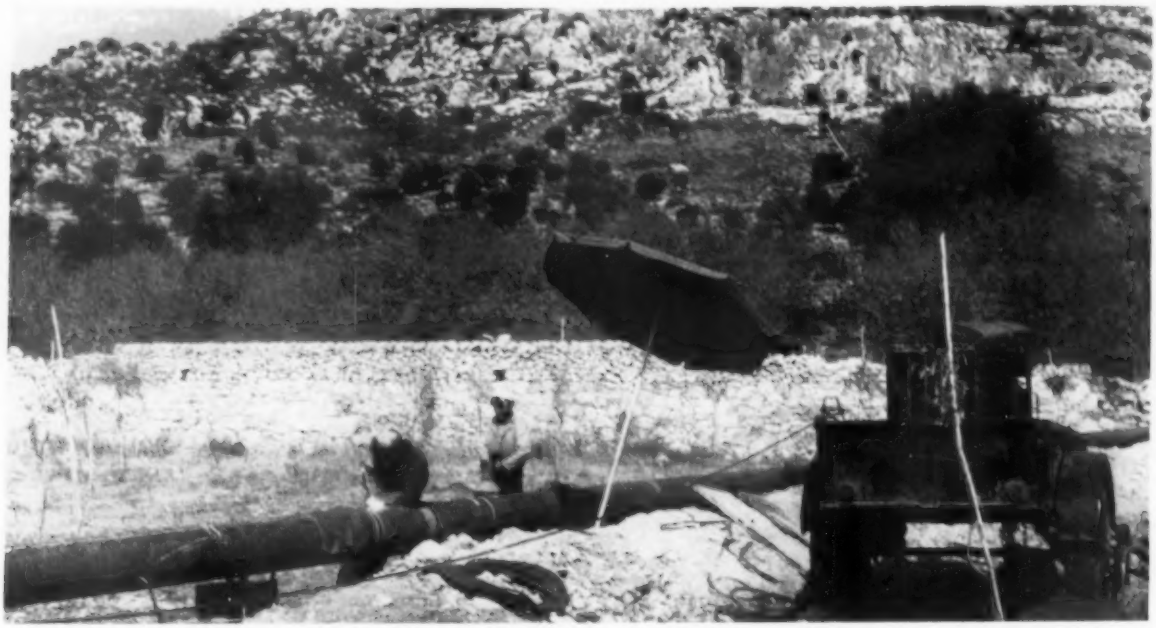
Back to the pick and shovel in Sicily

GULF ITALIA CO.'s Sicily crude pipeline was built under almost every imaginable handicap. From right-of-way to cleanup, it was a pipeliner's nightmare.

Some 2,300 property owners had to be contacted along the 36½-mile route where the 14-in. pipe was laid. Construction crews had to walk a tightrope on the 19-ft. right-of-way, probably the narrowest ever used on an entire line, to minimize the land area disturbed. Sixty-three per cent of the ditch had to be blasted out of solid rock. And when workers weren't clambering up 60° to 70° grades of the mountains or dismantling rock fences which were encountered every 100 ft., they were threading the needle through centuries-old groves of olives, almonds, and orange trees which dot every tillable acre on the slopes.

On April 15, 1956, construction began. Under favorable conditions and no less formidable terrain, the line could have been completed in 30 days. This one wasn't finished until 300 days later. For it was built almost

LOADING a bent section of the pipe meant muscle power by Sicilian laborers who took over pipe-handling duties.



WELDERS used portable lightweight machines along the narrow 19-ft. right-of-way. Pipe was air-tested every mile.

entirely by hand. The pick and shovel replaced the ditching machine and backhoe. Muscle power of Sicilian laborers took over the pipe-handling role of sideboom tractors and cranes. Pipe was strung by hand along the stretches which were inaccessible to trucks.

Crude began flowing from Gulf's Ragusa field through the line on February 4. Capacity with one station at Ragusa is 30,000 bbl. per day, some 12,000 bbl. above initial throughput. A second station planned at Plazzolo Acreide will increase capacity to 50,000 bbl. per day. The pipeline terminates near the sea at Augusta. A 14-in. spur carries crude to the 44,000-bbl. Raisom refinery 5 miles away. A 30-in. gravity-loading line, extending 4 miles to the site of the dock to be built later, will permit tankers to load at the rate of 19,000 bbl. per hour.

Construction . . . There wasn't a foot of soft digging anywhere along the route. The ditch gang started by shoveling and picking the soil from the rock, where there was any soil cover to remove. Rock was then drilled and blasted with dynamite. Laborers lifted out loosened rock by hand.

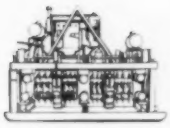
The final ditch was shaped by skilled rock diggers, who have developed a specialized trade on the limestone-covered Mediterranean island. On the sharpest grades, the ditch was dug 10 or 12 ft. deep.

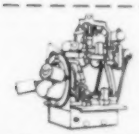
Rock fences had to be torn down carefully to open 10 to 15-ft. passageways for pipe and equipment. These fences average 4 ft. high, 3½ ft. at the base, and 2 ft. across the top. Restoring them was the biggest single cleanup job, bringing into play the skill of yet another specialized Sicilian occupation—the fence builders.

Welders used portable lightweight machines which could be pulled over the uneven terrain by manpower.

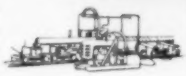
Before lowering in, pipe was air-

PICK-AND-SHOVEL EXCAVATION meant slow progress for the 36½-mile route. Rock was drilled and blasted with dynamite.

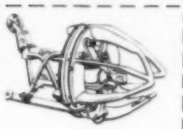

stationary cleaning & priming machine


line traveling coating & wrapping machine

pipeline cradles

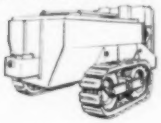

stationary coating & wrapping machine

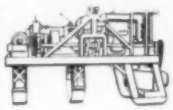
ditch padder

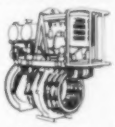

internal line up clamp

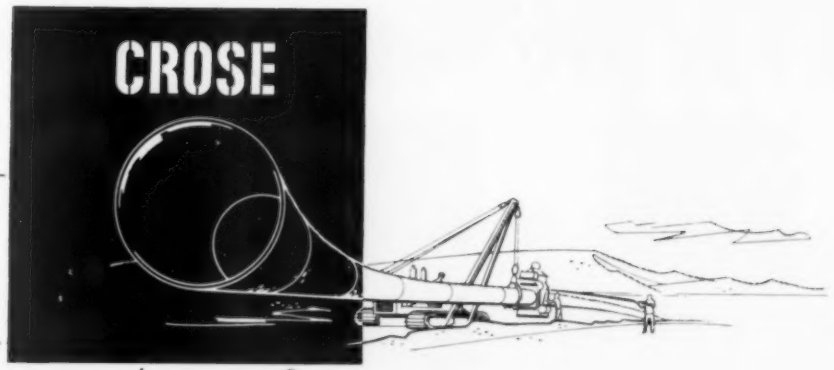
pipe cutting & beveling machine

Cinch hydraulic pipe bending machine


pipeline kettles


road boring machine


line traveling cleaning & priming machine



A COMPLETE EQUIPMENT LINE FOR PIPELINE CONSTRUCTION

The world-wide pipeline construction industry looks to Crose for the most complete line of equipment. Industry experience has proved that Crose equipment is outstanding for efficiency, operating economy—and it is always closer to work in progress because of our many strategic supply points.

The Crose MANUFACTURING COMPANY, INC.

2715 DAWSON ROAD • TULSA, OKLAHOMA • PHONE MAdison 6-2171
New York, N. Y. Ph. BRyant 9-2236 • *Denver, Colorado Ph. EMpire 6-0332 • *Houston, Texas Ph. MIssion 5-2484 • *Newark, N. J. Ph. MArket 4-3650
DISTRIBUTOR: CROSE-CURRAN LTD. — *Edmonton, Alberta Ph. 3-5135 • *Winnipeg, Manitoba Ph. SPruce 4-1851
*Warehouses in 5 locations

MUD MIKE says:

So you got time to act like an executive now that PALCOTAN keeps mud working right!

In controlling viscosity, gel strength and water loss, *Palcotan* takes a lot of strain off everybody from the rig to the front office. Mud Mike isn't the only one who's discovered that it not only costs less, but is particularly effective at low concentration.

P.S.: PALCO SEAL is the ideal companion product, too, for control of circulation losses.

Write for details

Available through oil field and mud service organizations

THE PACIFIC LUMBER COMPANY

100 Bush Street, San Francisco 4, California

Make

MERCANTILE FINANCING

Your First Step

OIL AND GAS DEPARTMENT

MERCANTILE NATIONAL BANK

Dallas, Texas

Member Federal Deposit Insurance Corporation

MERCOID®

EXPLOSION PROOF

SAFETY CONTROLS

For

PRESSURE
TEMPERATURE

Hermetically sealed mercury switch

Visible On-Off circuit

Visible calibrated dial

Visible operating point indicators

Outside adjustments

Explosion-proof housing (Rugged in construction)

SERIES DAE AND DSE

Mercoid Controls are available in steel cabinets made to your specifications.

Built to last the life of the equipment it serves

Our engineers are at your service —send in your control problem.

THE MERCOID CORPORATION
4201 Belmont Ave., Chicago 41, Ill.

Pipeline Patrol

TUNNELS were dug under ancient olive trees to help preserve land-owner's property along the route.

tested in 1-mile sections to check weld quality. When the line was completed, it was water-tested in three sections. Gulf said the test results reflected the highest-quality workmanship on the part of Sicilian laborers; Soc. Montubi, the Italian contractor which had wide experience laying water lines; and the technicians and welders from northern Italy. Three Gulf pipeliners from the United States helped the contractor.

The construction methods, although crude, were considered very successful and the most economical possible for the terrain and right-of-way limitations.

BOOK

UNDERGROUND CORROSION by Melvin Romanoff. Published by U. S. Government Printing Office, Washington 25, D. C. Order from Superintendent of Documents. 227 pp. $3.

This book supersedes National Bureau of Standards Circular 450 and is a final report on the studies of underground corrosion conducted by the bureau over a period of 45 years. Results of both field and laboratory investigations for electrical and electrochemical aspects including cathodic protection are presented in this book.

Up to 1922 the studies were confined to corrosion due to stray-current electrolysis and its mitigation. After it became apparent that serious corrosion occurred in soils under conditions that precluded stray-currents as an explanation, a field-burial program was started to obtain information pertaining to the effect of soil properties on the corrosion of metals.

Approximately 37,000 specimens, representing 333 varieties of ferrous, nonferrous, and protective-coating materials were exposed in 128 test locations. Illustrations and results of these specimen tests are presented in this new book.

'RUSS MASTER' SAYS...
KNOCK OUT RUST WITH THIS 1-2 PUNCH!
1. Prime with Rustmaster, proved by laboratory comparison tests to be the best rust inhibitor!
2. Finish with one of General's specialized industrial coatings.
RUSTMASTER SYSTEM
Ask for details and specifications.
GENERAL PAINT CORP., Tulsa and San Francisco

Write or Wire
for Monthly Stock Lists

- VALVES
- PRESSURE TUBING
- STEEL

Peerless Supply Co., Inc.
L. D. 75 & 76 P. O. Drawer 36-A
Shreveport, La.

SKIP
THIS ADVERTISEMENT
ONLY IF YOU DO NOT HAVE A REFRIGERATING SYSTEM IN YOUR PLANT . . .

1. Air and other incondensable gases are almost always present in refrigerating systems.
2. Air commonly increases head pressure 10 to 40 lbs.
3. Every 4 lbs. excess pressure increases power costs 2%, reduces capacity 1%.
4. Purging of this air manually or with inefficient devices wastes time and refrigerant and seldom, if ever, gets rid of all the air.
5. Automatic purging with an Armstrong Purger gets rid of *all* of the air, with almost no loss of refrigerant and with a great saving in the operator's time.
6. An Armstrong Purger will quickly pay for itself in power, refrigerant and labor savings alone, to say nothing of reducing wear and tear on your refrigerating system and giving you the full capacity that was built into it.

FOR PROOF call your nearby Armstrong Representative, or write:

ARMSTRONG MACHINE WORKS
"The Steam Trap People"
8681 Maple Street
Three Rivers, Michigan

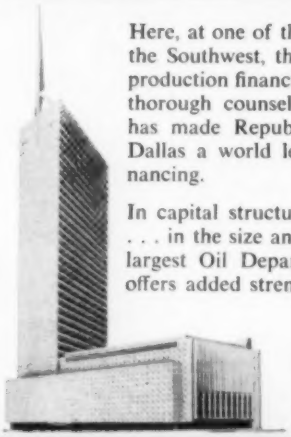
SEND FOR BULLETIN NO. 2212 . . . four pages of complete information about the Armstrong Forged Steel Purger—why it is needed—how it works—savings it effects—reports from users—prices and physical data. Send for your free copy today.

ARMSTRONG REFRIGERANT PURGERS
Sold Under a Satisfaction-or-your-money-back Guarantee

TOUGH FINANCING PROBLEMS?

rely on

REPUBLIC National BANK of Dallas



Here, at one of the pioneer oil banks of the Southwest, the toughest problem in production financing receives the expert, thorough counsel and guidance which has made Republic National Bank of Dallas a world leader in petroleum financing.

In capital structure and total resources . . . in the size and scope of the South's largest Oil Department . . . Republic offers added strength you can *bank* on!

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

CAPITAL & SURPLUS $75,000,000
LARGEST IN THE SOUTH
•
ADDED STRENGTH YOU CAN BANK ON

MANNESMANN

and associated companies

Mannesmann-Easton Metal Powder Company, Inc., *Easton, Pa.*
Mannesmann-Easton Plastic Products Company, Inc., *Easton, Pa.*
Mannesmann-Meer Eng. & Constr. Co., Inc., *Easton, Pa.*
Mannesmann Tube Company, Ltd., *Sault Ste. Marie, Canada*

Serving Oil Production

Not only on the continent of Europe, but in practically every corner of the world the name MANNESMANN has since long been a synonym for high-quality steel pipe.
Confidence in Canada's fast-growing oil industry was our principal reason for building a new pipe mill at Sault Ste. Marie, Ontario. Its main products are seamless casing and line pipe from 4 1/2" to 10 3/4" O.D. made according to the API standards.
Additionally, our production will include refinery pipe and hot-finished mechanical tubing.

MANNESMANN TUBE COMPANY, LTD.
SAULT STE. MARIE, ONT., CANADA

Represented in the United States by AMERICAN MANNEX CORPORATION
233 Broadway, New York 7, N.Y., and
713 Texas National Bank Building, Houston, Texas

449/1e

Among the

Drilling Contractors

Continental Shelf Drilling Co. is to drill a deep wildcat test for **Bateman Drilling Co.** in the Cox Bay area, on the Breton Sound side of Plaquemines Parish, Louisiana. It is a drilling-barge job on State Lease 2467, about 30 miles down the Mississippi River from New Orleans.

Doc Drilling Co., Franklin, La., has the contract on a deep test Olin Gas Transmission Co. is starting at a wildcat location in the Coffee Bay area, in the coastal marsh region of Lafourche Parish, Louisiana. Location is more than a mile east of production. Plans call for a 13,500-ft. test.

Herndon Drilling Co. is contractor on a 6,250-ft. Arbuckle test Vaughey & Vaughey will put down in western Otero County, southeastern Colorado. Location is about 25 miles west of La Junta on Vaughey's Sifney lease, in 3-24s-59w.

Halbert Drilling Co., Tyler, Tex., has a new contract job going 5 miles south of Rusk, in Cherokee County, East Texas. It is a 5,600-ft. Woodbine test for LaGorce Oil Co., of Fort Worth. Location, at 1 Guenzel, in the James M. Hogan Survey, is about 1½ miles southeast of Columbian Fuel Corp.'s recently completed discovery well, designated as South Rusk field.

Jack Caudle, of Mertzon, Tex., has contracted for a 2,500-ft. San Andres test to be drilled for Roscoe Simpson, of San Angelo, Tex., in southwestern Irion County, West Texas. Location is 6 miles northwest of Barnhart. It is 3 miles southeast of Peterson-San Andres field, on the Sol Mayer estate.

Tewa Drilling Co. is contractor on a 6,600-ft. Paradox test E. B. La Rue, Jr., is starting in southwestern Montezuma County, in the southwestern corner of Colorado. Location, at 1 Ute Tribal, in 8-33n-19w, is about 8 miles east of the Utah line. It is about 5 miles northwest of the abandoned Mancos Creek field.

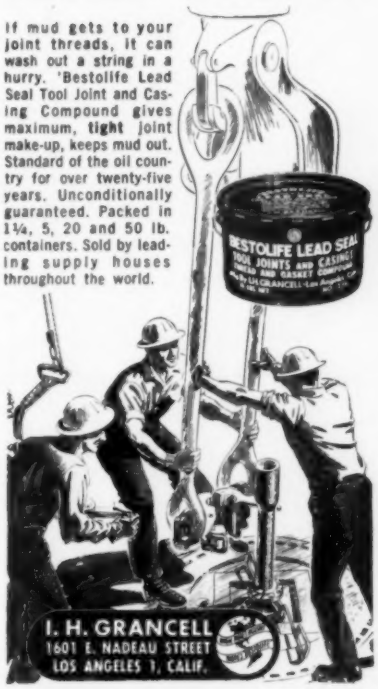
Slim Hole Drilling Co., Houston, has a new contract operation at Mykawa, on the south edge of Houston, in Harris County, Texas Gulf Coast. It is a 9,000-ft. Vicksburg test for Carl Dudley at 1 Witt and others. Location is about 1½ miles west of Mykawa.

Mountain States Drilling Co., Denver, has a new wildcat job in the Horseshoe Bend area, Uintah County, northeastern Utah. It is a 6,500-ft. Green

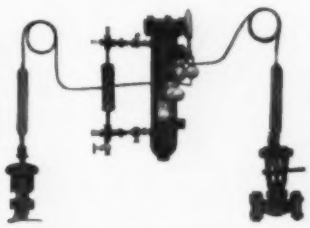
PICTURED are R. L. Gresham (left), tool pusher, and some of his crew on a rig Big "6" Drilling Co., of Houston, has been operating on contract in Jefferson County, Texas Gulf Coast. Picture was taken on a test drilled for W. R. Brown at a wildcat location 2½ miles northeast of Fannett and about a mile off the west flank of Lovell's Lake field. The test was quit at 8,002 ft. Crewmen shown (left to right) are: Alvin Hotz (driller), R. E. Stinnett, Jack Fleming, and W. E. Bebee.

INSURANCE AGAINST WASHOUTS

If mud gets to your joint threads, it can wash out a string in a hurry. 'Bestolife Lead Seal Tool Joint and Casing Compound gives maximum, **tight** joint make-up, keeps mud out. Standard of the oil country for over twenty-five years. Unconditionally guaranteed. Packed in 1¼, 5, 20 and 50 lb. containers. Sold by leading supply houses throughout the world.



Are Your Boilers REALLY Safe?



INFERNO Boiler Safety Units furnish complete AUTOMATIC safety three ways: by keeping proper water level, by blowing a whistle if water supply fails, and by cutting off fires if whistle is ignored. Write today for your free copy of Bulletin No. 15-C.

THE INFERNO CO.
Box 1138A
115 RICOU St.
SHREVEPORT, LA.

HEAVY-DUTY TRIPOD DERRICK
Lets You Move "Big Capacity" Around

For use with both 36-L and 48-L spudders, Bucyrus-Erie's heavy-duty tripod derrick has sufficient height and stability to handle casing loads up to 300,000 pounds when rigged for 10-part hoist. Completely raised, the derrick is 70′ 4″ high.

Despite the derrick's size, spudder mobility is retained. Erected in five easy steps, this derrick is easy to tear down and move. Each of the five units can be disassembled and transported separately. Look: 45557

36-L Top-to-bottom drilling to 3,500 feet. Servicing to 4,000 feet. Swings up to 5,000 pounds of tools.

48-L Top-to-bottom drilling to 6,000 feet. Servicing to 7,000 feet. Swings up to 6,700 pounds of tools.

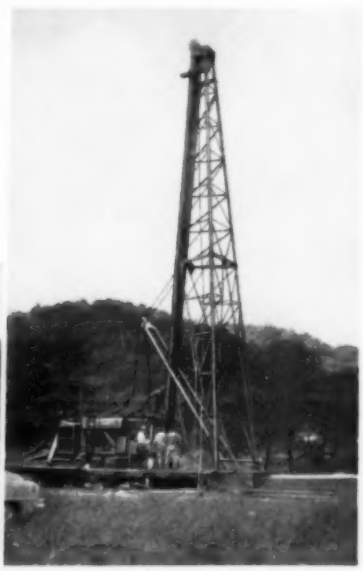
BUCYRUS ERIE

Write today for complete information.

BUCYRUS-ERIE COMPANY
South Milwaukee, Wis.

1. Derrick sections are assembled on the ground. Legs are hinged to the base and the gin pole is set in place preparatory to raising derrick.

2. Using the bull reel drum for hoisting, the derrick begins to rise. Hinged front lower section is pulled into place by the derrick hoist.



3. When the derrick is completely raised, the gin pole is removed and the front lower section is attached.

KRAFTBILT

OIL INDUSTRY FILING EQUIPMENT

ELECTRIC LOG CABINET E-24

Heavy-duty ball bearing construction, strong suspension extensions, finger-tip drawer control.

Two separate follow blocks in each drawer of all-steel Model E-24 give actual 8-drawer efficiency . . . and each will easily handle 500 full-size standard electric well logs by using KRAFTBILT folders or filing envelopes. Logs file and transfer without refolding.

Horizontal Rollfile H-342

Model V-96 Vertical Rollfile

KRAFTBILT folders, filing envelopes, pressboard guides, metal guide tabs engineered to fit Model E-24.

WRITE for Catalog 57-B on **kraftbilt**

ROSS-MARTIN COMPANY

P. O. BOX 800 TULSA 1, OKLAHOMA

INCREASE PRODUCTION

CLEAN OUT CHOKING SAND

Excessive sand and sediment holds back your oil. For fast, easy clean out with fewer round trips and less downtime, use world famous Miller Sand Pumps.

Write for descriptive price list.

SAND PUMP SIZES IN STOCK

O.D.—2½, 3, 3½, 4¼, 5, 5½, 7 in.
Lengths—20, 25, 30 ft.

Composite Catalog Page 3419

MILLER SAND PUMPS

MILLER SAND PUMP CO.

General Offices, Box 4516
Oklahoma City 9, Okla.
EXPORT OFFICES
30 Rockefeller Plaza
NEW YORK 20, N. Y.

River test for Gulf Oil Corp. at 1 Wonsits-Federal, in 1-8s-30w. Location is about 6 miles southeast of Brennan Bottoms field and about 10 miles southwest of Red Wash field.

Atkins Drilling Co., San Antonio, will drill a deep test for Gulf Coast Leaseholds, Inc., at a wildcat location 8½ miles south of Gonzales, in Gonzales County, Southwest Texas. It will be on the operator's Schlick lease, in the William Newman Survey. Objective is the Wilcox about 8,800 ft.

Southland Drilling Co. is well down on the deep wildcat test it is drilling for Universal Petroleum Corp. and others in the Ritson Morris Survey, 2 miles north of Seabrook, in Harris County, Texas Gulf Coast. Location, on the west shore of Galveston Bay, is about 5 miles southwest of Cedar Point field, and about 5½ miles southeast of Clear Lake field. The test, 1 J. W. Blalock estate, is scheduled to go to 10,000 ft.

Zach Brooks Drilling Co., El Dorado, Ark., has contracted for a Sinclair Oil & Gas Co. deep test in the Soso area of northwestern Jones County, Mississippi. The test, 1 Murray, in 11-9n-13w, is scheduled to go to 13,300 ft. for a look at the Lower Cretaceous-Hosston formation. Location, just northeast of Soso (town), is about 1½ miles south of Soso field. It is about 2¾ miles east of Gulf Oil Corp.'s Lower Cretaceous discovery well, completed early this year, at Gitano.

Crow Drilling & Producing Co., Shreveport, is on a new contract job in northeastern Franklin Parish, northeastern Louisiana. It is a 5,000-ft. Tuscaloosa test for States Oil Co., Inc., also of Shreveport. Location, at 1 McIntyre and others, in 31-16n-9e, is about 2¾ miles west of Lamar, and about 2 miles from production.

C. G. Davis Drilling Co., Stephens, Ark., has a new wildcat operation under way in the Genoa area, about 10 miles southeast of Texarkana, in Miller County, southwestern Arkansas. It is a 4,000-ft. Paluxy test for J. K. Wadley, of Texarkana, and C. G. Davis, of the drilling company. Location is about 2 miles northeast of production at Genoa.

Del Mar Drilling Co., Corpus Christi, is getting under way on a 6,500-ft. test it is undertaking as a joint operation with W. J. Carey at a wildcat location 2 miles south of Agua Dulce, in western Nueces County, lower Texas Gulf Coast. Location is at 1 Kelly, in Section 24, Los Sauces grant.

B and W SCRATCHERS AND CENTRALIZERS

for a good cement job

Complete field service is included when you specify B and W Scratchers and Centralizers. Our experienced service men, located in all active drilling areas, will install equipment and assist throughout the entire cementing operation.

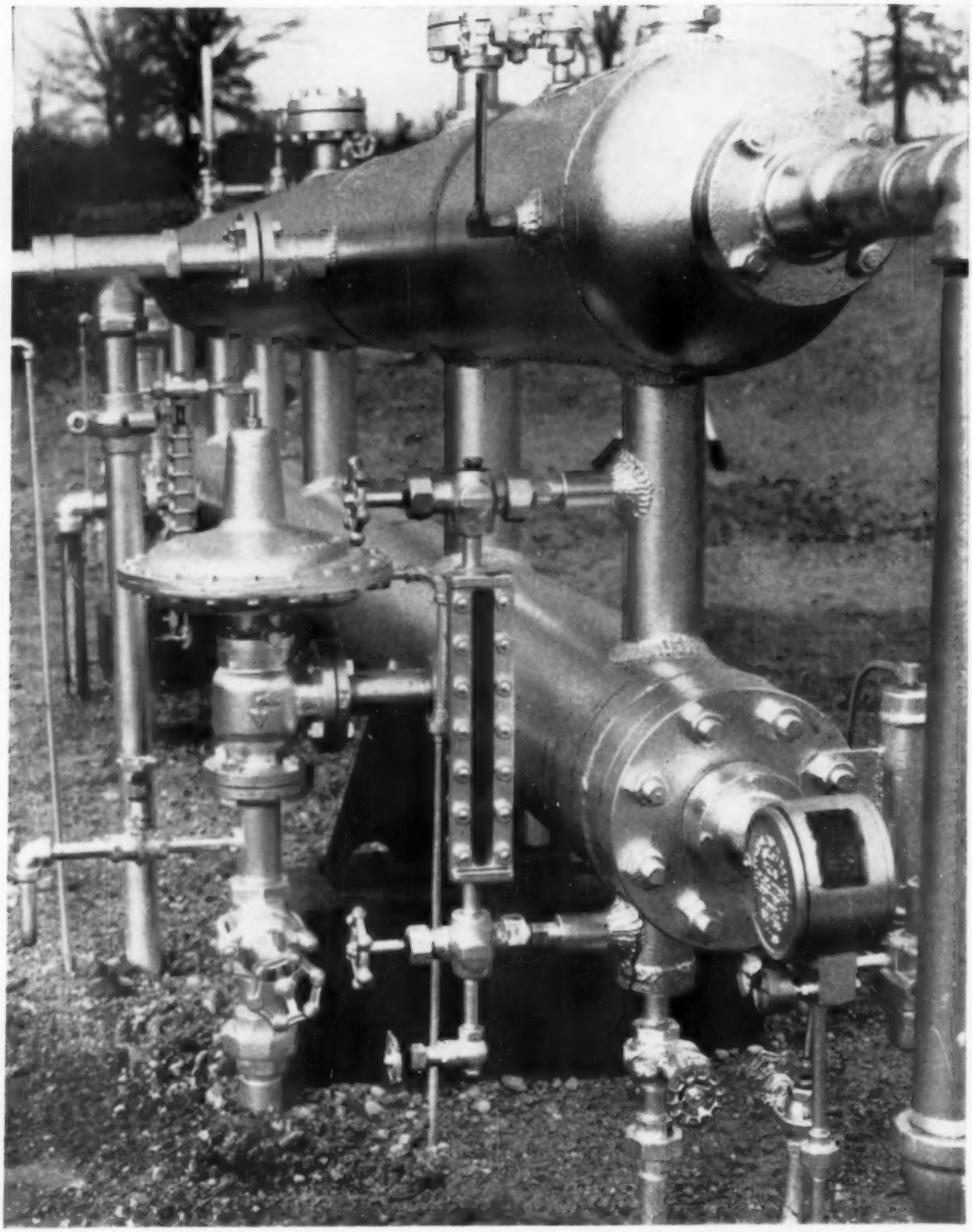
B and W Inc.

Well-Completion Specialists

GULF COAST
Box 5266
Houston 12, Texas
Phone WA 3-6603

WEST COAST
19706 S. Normandie Ave.
Torrance, California
Phone FAculty 1-2463

6352



● **PENBERTHY GAGES** on two stage separator,
The Superior Oil Company Lease, Zablaudil

Everywhere... YOU'RE SEEING MORE PRODUCTS BY

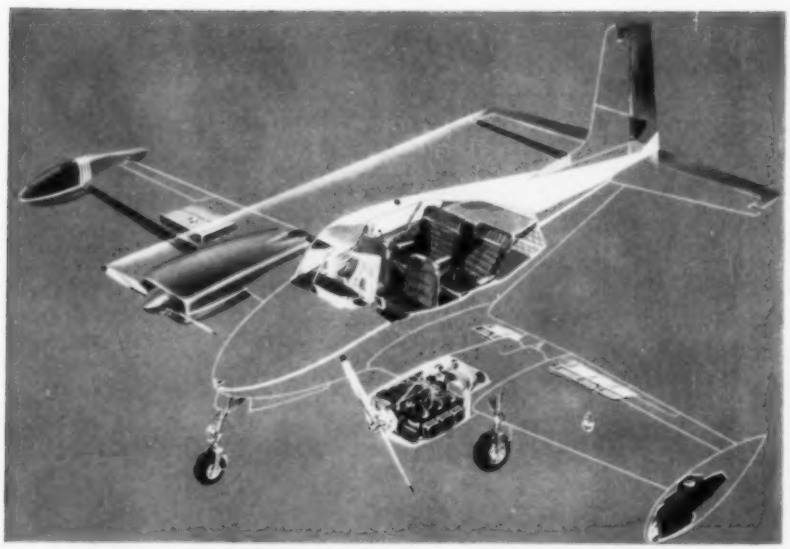
PENBERTHY MANUFACTURING COMPANY
Division of Buffalo-Eclipse Corporation
1242 Holden Avenue Detroit 2, Michigan

PENBERTHY

- EJECTORS
- INJECTORS
- CYCLING JET PUMPS
- ELECTRIC SUMP PUMPS
- LIQUID LEVEL GAGES
- GAGE VALVES

SHOWCASE...

NEW EQUIPMENT



Twin-Engine Plane Features Improvements

Here's a new, improved version of the Cessna twin-engine commercial Model 310 plane. It's designated the 310B.

Changes in the 213 m.p.h. light twin-engine plane designed to improve pilot efficiency and passenger comfort include: (1) a newly designed instrument panel, (2) reduction of noise level, (3) new seating arrangements, (4) newly designed lighting system, and (5) a double retractable step.

The instrument panel has all navigation equipment located in the center. Accessory options have been relocated for more functional usage. The panel presentation is said to provide a more convenient grouping of instruments, switches, and radio equipment for greater efficiency during IFR en route and approach conditions, according to the company.

Red post lights are used throughout the panel layout and mounted adjacent to the instruments and switches. Brilliancy is controlled in four separate zones with rheostats.

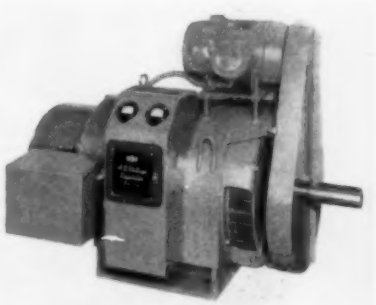
A large overhead-lighting console is offered as a secondary source of red and white flood lighting. It also may be used for map reading. The overhead console accommodates a five-outlet oxygen manifold.

Sound level is said to be improved by increasing the thickness of the windows and windshield to ¼ in.

An improved three-passenger rear seat is offered as standard equipment. The seat reclines an additional 2 in. farther than in previous models.

Maximum gross takeoff weight has been upped to 4,700 lb. Maximum landing weight remains at 4,600 lb. The increase in maximum gross weight gives a useful load of 1,735 lb. **Write or call: Cessna Aircraft Co., Wichita, Kans., for details on Model 310B.**

•



Electric Generator Developed for Offshore Rigs

Developed for supplying the electric power requirements aboard offshore drilling rigs where a fire or explosion would be highly disastrous, this new generator incorporates two important features—an enclosed exciter and enclosed collecter rings. Made of standard dripproof construction, it is of-

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

.....

Described in THE OIL AND GAS JOURNAL - Issue of **July 15, 1957**

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

DATE.....

New Equipment

fered with a top-mounted belted exciter.

The exciter, an explosionproof unit, is electrically connected to the generator with explosionproof fittings. The primary spark-producing part of the generator is thus explosionproof and isolated.

The collector rings are enclosed in a heavy cast-steel enclosure. Thus, collector-ring arcing is confined to the enclosure. Too, the enclosed collector-ring housing limits the corrosive effect of sea air on the brass collector rings.

The generator provides both a primary source of power and a power source for auxiliary systems, such as mud reclaiming. **Write or call: Electric Machinery Mfg. Co., 800 Central Avenue, Minneapolis, Minn., for details on offshore generator.**

●

Rectilinear Potentiometer Offers Variety of Features

The ability to operate accurately under vibration environments to 20 g. is

offered by this new Servonic Model G rectilinear potentiometer, the maker claims. All external portions of the instrument are constructed of stainless steel. Lead wires are Teflon covered and insulated.

Operating in temperature environments to 400° F., the instrument uses a double seal at the actuation shaft to protect the interior against humidity and foreign particles. Various mounting configurations may be used. These include flanges, an integral ball joint, and a threaded case.

Available ranges are from 0.5 to 10 in., with resistances from 500 to 10,000 ohms per in. **Write or call: Servonic Instruments, Inc., 1145 South Fair Oaks Avenue, Pasadena, Calif., for details on Model G rectilinear potentiometer.**

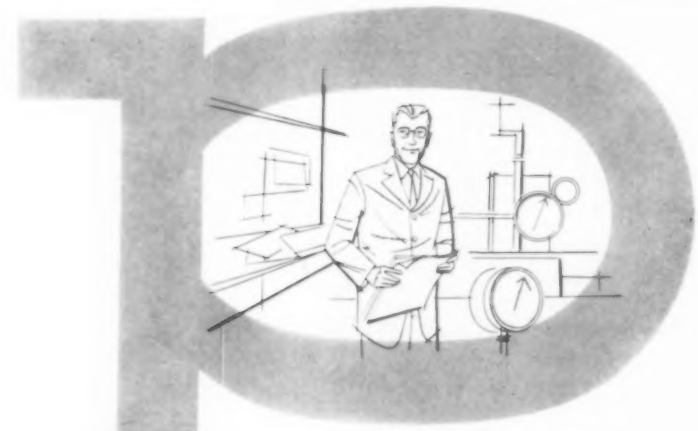
●

Calibrator Handles Up to 12 Thermocouples

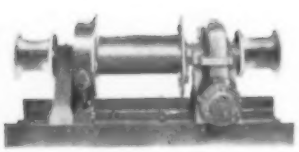
Temperature calibration and sensitivity adjustment in multichannel recording systems can be done readily with this new Model TC2 thermocouple control unit, the maker says. The unit couples as many as 12 thermocouple-measuring circuits, each to its recording element, (usually an oscillograph galvanometer). And it provides for the injection of known voltages to produce temperature-calibration traces.

A reference temperature base also is provided through a separate bucking voltage source included in the control unit.

The Model TC2 combines with the manufacturer's RJ series reference junctions and any galvanometer type of oscillograph to form a complete temperature-recording system. The unit measures 7½ in. wide by 11½ in.



That's the guarantee you get when you put a Tulsa Winch to work . . . because Tulsa Winches are precision-made from highest quality materials, then tested to withstand pulls TWICE their rated capacities. They are designed for smoothest operation under the most rugged conditions . . . in a wide range of models and sizes. Also a complete line of power take-offs.



TULSA WINCHES

Tulsa Winch
TULSA · OKLAHOMA DIVISION OF VICKERS Inc.

YOU'RE UP, Mr. OILMAN!

Here's your chance to make a hit with your friends and neighbors!

Because you are an oilman, all eyes will be on *you* during Oil Progress Week—October 13 to 19. It's the week when oilmen everywhere report to the nation on the progress made in their industry.

Oil Progress Week also gives you a great opportunity to create good public relations in your community for yourself and your industry—and the Oil Information Committee has much to offer to help you.

Here are some suggestions

Attractive, professionally-prepared materials are available for you to use in your community—films and speeches for radio and TV, window posters, exhibits and demonstrations, plus a complete ad mat proof book with ads that *any* oilman can use. This well-rounded community relations program contains everything you'll need to help you win prestige and friends.

One of the best ways to get started is to contact your local Oil Information Committee Chairman. He will help you plan a program that will work for you in your community.

So, team up to make Oil Progress Week —*your week*—a big success. Clip out and mail this coupon today!

OIL PROGRESS WEEK
October 13th-19th
1957

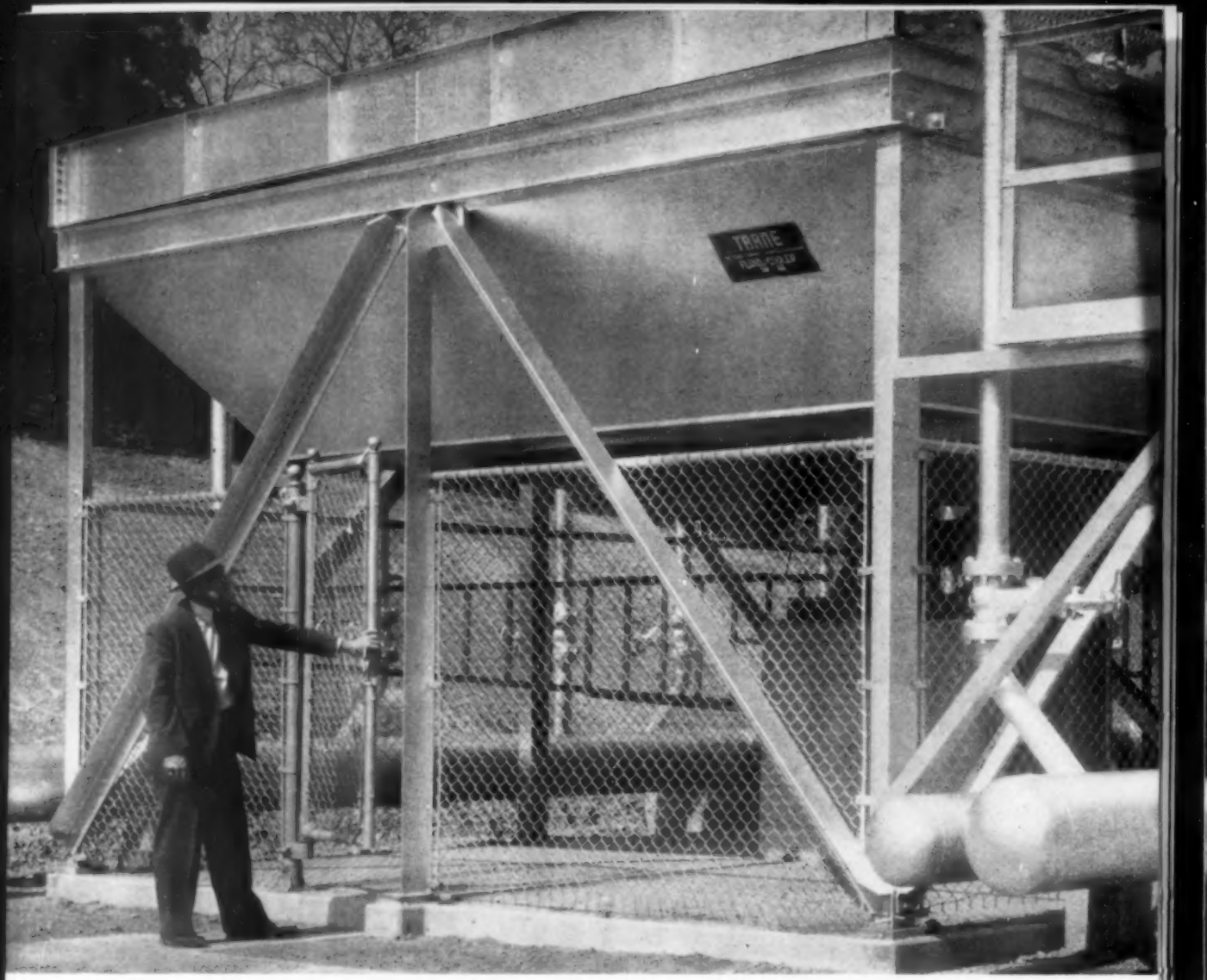
American Petroleum Institute, Dept. G
50 W. 50th Street, New York 20, N. Y.

I want to take part in promoting Oil Progress Week in my town. Please send me your *free* booklet explaining Oil Progress Week activities and listing the materials available to me.

NAME _____

ADDRESS _____

CITY _____ **ZONE** ____ **STATE** _____



At Texas Eastern's Holbrook, Pa. compressor station, engineered by Brown and Root, three TRANE Fluid

Another major pipeline installs Trane

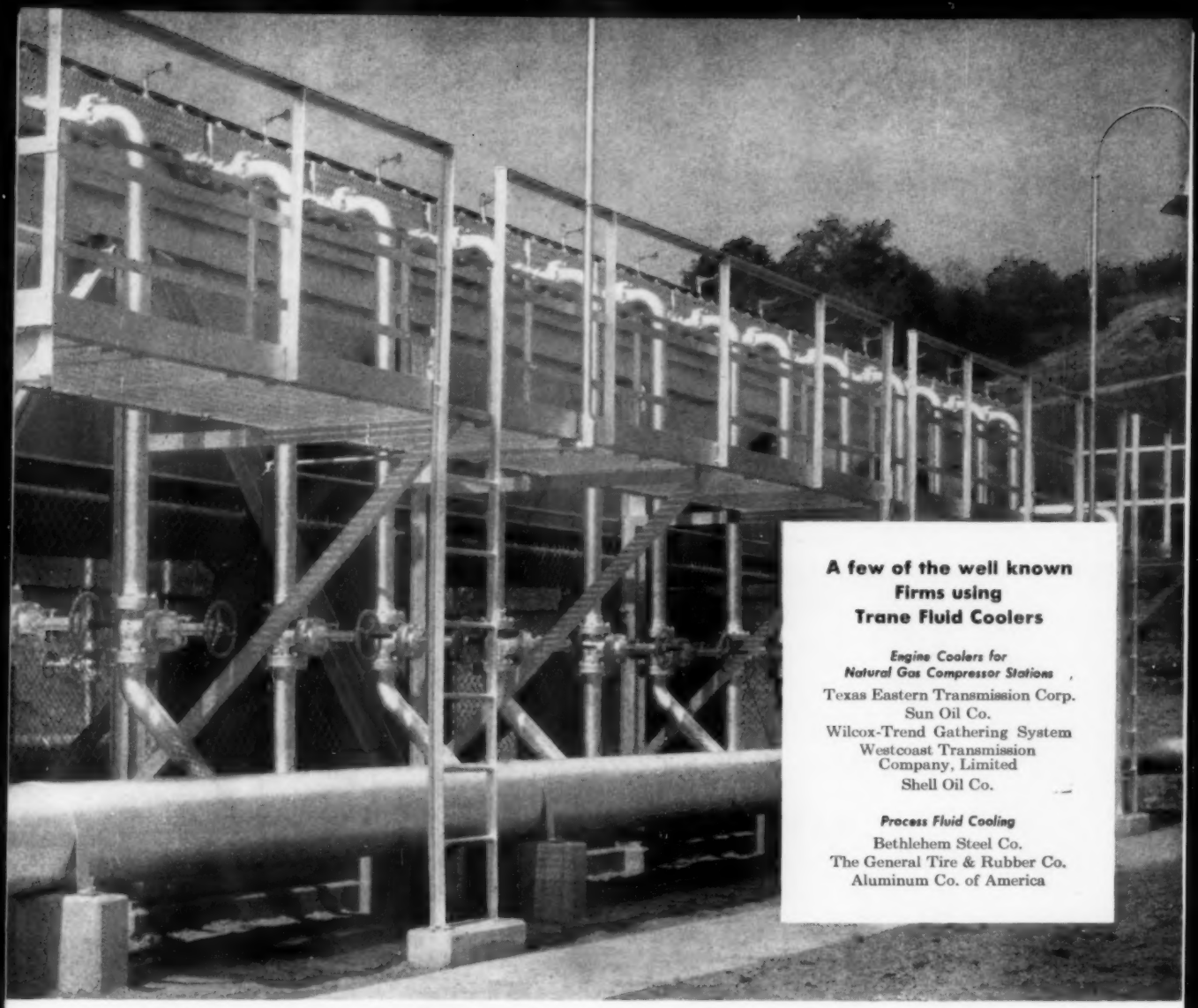
Trane equipment now on the job at Texas Eastern's Holbrook, Pa. station

More and more pipeline transmission companies are turning to TRANE Fluid Coolers to handle important cooling jobs. Many of these users have reported that TRANE Fluid Coolers are rugged, dependable and simply designed . . . with a minimum of maintenance and adjustment problems.

When you turn to TRANE, you can depend upon the *accuracy and completeness* of TRANE's capacity ratings. These ratings are based upon thorough laboratory testing—supported by many years of actual field experience.

Unlike many manufacturers, TRANE makes all its own coils—has had thirty years of experience in this highly specialized field. And trained personnel in 90 TRANE field offices take a responsible interest in *your* particular fluid cooling job! That's why you can turn to TRANE when you have a fluid cooling problem—confident that TRANE can meet your requirements—*and deliver!*

For complete information on how TRANE can help you, call your nearby TRANE Sales Office—or write TRANE, La Crosse, Wisconsin.



A few of the well known Firms using Trane Fluid Coolers

Engine Coolers for Natural Gas Compressor Stations

Texas Eastern Transmission Corp.
Sun Oil Co.
Wilcox-Trend Gathering System
Westcoast Transmission Company, Limited
Shell Oil Co.

Process Fluid Cooling

Bethlehem Steel Co.
The General Tire & Rubber Co.
Aluminum Co. of America

Coolers are used for cooling jacket water and lube oil cooling water for eight 1100 hp gas engine compressors.

transmission company Fluid Coolers !

Air handling equipment — three 14-foot fans deliver total of 711,000 cfm. Fan, motor and gear box are factory-aligned on a single metal base. All framework parts are pre-drilled and match-marked.

Removable Plugs opposite tubes offer access to simplify cleaning and inspection. These are standard coils with flat plate aluminum fins *mechanically* bonded to $\frac{5}{8}$" OD x .035 Admiralty tubes.

For any air condition, turn to

TRANE

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

The Trane Company, La Crosse, Wis. • Eastern Mfg. Div., Scranton, Pa. • Trane Company of Canada, Ltd., Toronto • 90 U.S. and 19 Canadian Offices.

New Equipment

high by 8 in. deep and weighs 5 lb. **Write or call: Pace Engineering Co., 6914 Beck Avenue, North Hollywood, Calif., for details on Model TC2 thermocouple control unit.**

●

Ring-Joint Flange Seals Combine Three Seals in One

These Petromec Flex-Tip gaskets make safe and reliable ring-joint flange seals, according to the maker. Made to code specifications, each gasket is said to be actually three independently acting seals combined in one unit. However, none of the seals interfere with the functions of the other seals.

Molded on the standard A.P.I. ring, inner and outer guards provide protection against corrosion from well fluid and gas on the inside and against the elements on the outside.

The seals, installed in the same way as any ring gasket, are available in all popular A.P.I. sizes, in Series 600 to 2900. **Write or call: Petroleum Mechanical Development Co., 7623 Katy Road, Houston 24, Tex., for details on Flex-Tip gaskets.**

COOL ANSWER TO A HOT PROBLEM
R & M "All-Weather-40" MOTORS
Because excessive heat shortens motor life and seriously reduces the effectiveness of lubrication, R&M "All-Weather-40" motors are designed to run cooler . . . even in the blazing sun! High velocity clean-sweep ventilation between the frame and windings prevents the sun's rays from adding appreciable internal heat. Under severest conditions, heat rise never exceeds 40° C.
Get complete information now on cooler-running R&M "All-Weather-40" motors. Write for Bulletin 3019-DGJ or call your R&M representative.
ROBBINS & MYERS, INC.
Motor Division
Springfield, Ohio

Volume Meter Uses Cone-Shaped Bottom

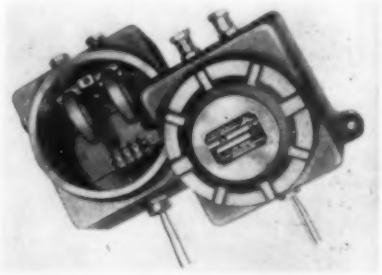
Now available for use in fields with a high-paraffin or other foreign-sediment content is this modified version of the FV Vol-U-Meter. The new design uses a cone-shaped bottom.

The entire vessel is plastic lined to eliminate the settling of foreign matter in the metering unit. The volume meter with cone bottom is equipped with a three-way valve.

It's also equipped with two liquid-level-control pilots, one at the upper dumping level and the other at the lower dumping level. Each complete cycle of accumulation, isolation, and discharge is registered on a counter or recorder.

The unit is available in working pressures of 125 to 2,400 psi. Applications include measuring oil for royalty and tax payments, testing wells, and segregating produced oil. **Write or call: Oil Metering & Processing Equipment Corp., 4843 Yale Street, Houston 18, Tex., for details on FV Vol-U-Meter with cone bottom.**

●

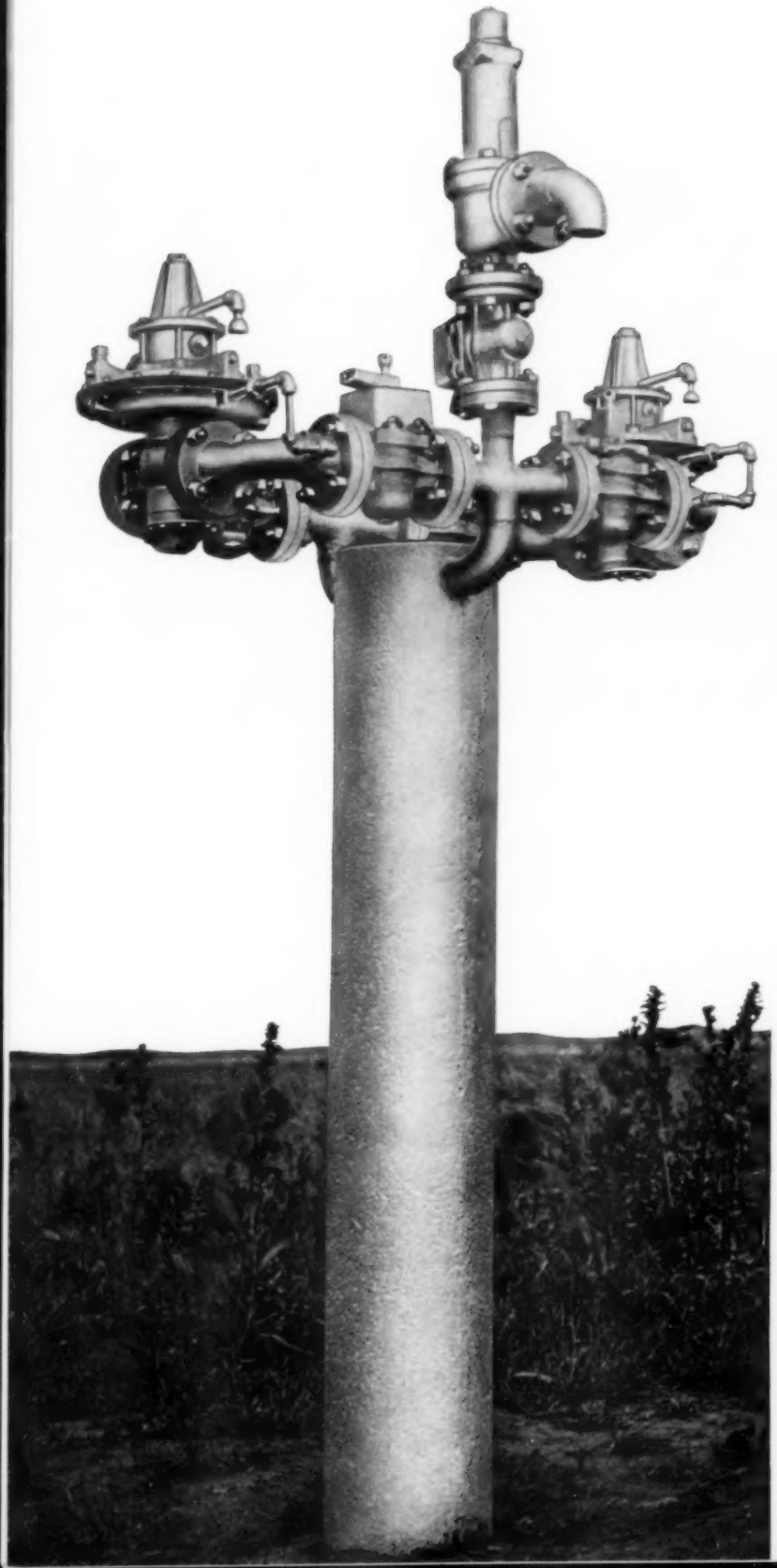


Differential Pressure Switch For Explosive Atmospheres

The pressure difference between two variable pressures or a variable and a reference pressure can be sensed with this new Model 932 pressure switch. Available in four classes of proof pres-

Why go down . . . when you can go up?

AND GET BETTER DISTRICT PRESSURE CONTROL



Why dig a costly vault when you have only a small distribution segment to serve from a high pressure line? Why not raise your pressure controls above ground and do the job quicker, better, more economically with Rockwell "1001" regulators and Rockwell-Nordstrom valves? There's no worry over tampering with this type installation. The Rockwell "1001" has a completely enclosed *power pilot* loading system. And Rockwell-Nordstrom valves can be fitted with locked hoods.

You'll get the highest degree of control accuracy with "1001" regulators . . . and at a most attractive price. Alert gas engineers find uses for them everywhere. They stock these versatile, compact, all-purpose regulators in anticipation of regular needs and emergencies. Write for bulletin 1059.

ROCKWELL MANUFACTURING COMPANY

PITTSBURGH 8, PA. Atlanta Boston Charlotte Chicago Dallas Denver Houston Los Angeles Midland, Tex. New Orleans New York N. Kansas City Philadelphia Pittsburgh San Francisco Seattle Shreveport Tulsa In Canada: Rockwell Manufacturing Company of Canada, Ltd., Toronto, Ontario

ROCKWELL "1001" REGULATORS

A Thousand and One Uses in the Gas Industry

IN the gas business you can't be half safe. The equipment you use, its installation and operation all must meet the highest security standards.

We at Rockwell carefully design and rigorously test our products with safety in mind.

One example: To resist impact, Rockwell meters are made with sturdy

SAFETY

A built-in bonus in Rockwell products

one-piece bowl type bodies. And they have but a single main joint to seal against leakage.

Another: Completely encased Rockwell regulators discourage tampering —protect against shock. Where the flexibility of outside weights is desired or where internal pressure relief is desirable, regulators with auxiliary safety controls can be recommended and furnished.

All Rockwell meters and regulators are tested before shipment at least double their rated working pressure. And all casting designs undergo a series of rupture tests at elevated pressures before release to production.

Because of such precautions, buyers of Rockwell equipment enjoy the peace of mind that comes only through use of the finest, safest equipment. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

FOUR WAYS IN WHICH ROCKWELL EXCELS

RESEARCH • SAFETY • ACCURACY • SERVICE

ROCKWELL GAS METERS AND REGULATORS

New Equipment

sures from 500 to 12,000 psi., the switch is said to permit the opening or closing of a circuit on increasing or decreasing pressure difference from 15 to 10,000 psi. at any point within the adjustable range of the model selected.

Employing two parallel Bourdon-tube sensing elements, it operates in any position which simplifies installation and speeds portable installations. The mechanism is housed in an explosion-proof enclosure rated for hazardous locations Class I, Groups C and D and Class II, Group E, F, and G.

The maker recommends the switch for operating relays, solenoids, motor controls, and similar devices. **Write or call: Barksdale Valves, Pressure Switch Div., 5125 Alcoa Avenue, Los Angeles 58, Calif., for details on Model 932 pressure switch.**

•

Angle-Dozer Attachment Developed for Loaders

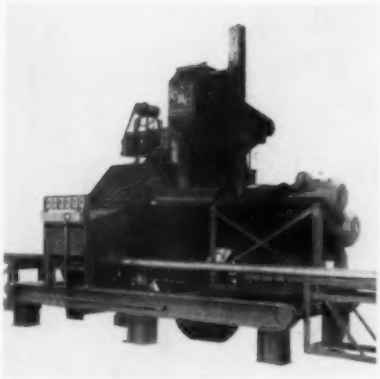
Here's a new angle-dozer attachment for Davis loaders that allows an operator to back fill by shaving in the dirt while running parallel to the ditch, according to the maker. After the pulling of two pins, the angle-dozer attachment can be offset 7 in. to either side of center.

The blade has a heat-treated cutting edge. Its tilt and bite are controlled hydraulically. The moldboard is 28 in. high and 72 in. wide. **Write or call: Mid-Western Industries, Inc., Wichita, Kans., for details on angle-dozer attachment.**

•

Pipe-Cleaning Machine Cleans Up to 90 Ft. per Minute

Here's a new grit-blast pipe-cleaning machine for stationary yards. Termed the CRC Auto-Blast, the machine is capable of thoroughly cleaning pipe up to 90 lineal ft. per minute in automatic successions, according to the



maker. Two models are available: a ¾ to 12-in. and a 6 to 36-in. pipe size.

In operation heavy, industrial steel grit is blasted on the pipe surface at 14,000 ft. per minute in a controlled pattern. The machine handles up to 2,500 lb. of grit per minute. The grit is reused in a continuous cycle.

The high-velocity abrasion is said to remove rust and mill scale with positive effectiveness, leaving the metal bare and warmed for primer application. **Write or call: Crutcher-Rolfs-Cummings, Inc., P. O. Box 2073, Houston 1, Tex., for details on Auto-Blast pipe-cleaning machine.**

Nothing drills like a
SPANG
DRILLING BIT
Performance Records show . . .
● More Footage
● Lower Costs
● Fewer Failures
It doesn't take drillers long to recognize a good thing. Look around you at the record breaking number of Spang Bits being used . . . convinced? . . . then go SPANG TODAY!
ENTIRE BIT DIE FORGED
COMPLETELY HEAT TREATED
SEMI-DRESSED ENDS
For Cable Tool data and catalog see your Spang dealer or write to:
The HIGHER STANDARD
SPANG & COMPANY
DEPT. O-1 BUTLER, PENNSYLVANIA
For over 60 years Manufacturers of Spang Weldless Jars and a Complete Line of Cable System Drilling and Fishing Tools for Oil and Gas Wells, Prospect Drilling and Shot Blast Holes.

THREADS LAST LONGER

with

IMPROVED

to meet the demands of faster, deeper, drilling

MONEY BACK GUARANTEE!

Sold through your favorite supply store

USE JIMMY GRAY DOPE BRUSHES

PETROLEUM DISTRIBUTING COMPANY

BOX 703 - HOUSTON, TEXAS - CApitol 4-9648

SHOWCASE . . .

New Equipment

High-Capacity Pumps Built for Severe Services

Providing capacities up to 25,000 g.p.m. in petroleum plants, this Goulds 24-in. pump offers performance characteristics to meet a wide range of applications, the maker reports. It comes in two types. Both units are exactly the same, except for the lower-half casing. The Fig. 3420 pump has a horizontal suction and discharge, while the Fig. 3423 has a vertical bottom suction and a horizontal discharge.

The single-stage double-suction pumps have horizontally split casings. The upper and lower halves are bolted and dowelled together. Removal of the upper half casing permits inspection, maintenance, and removal of the entire rotating element without disturbing suction and discharge piping.

The pumps can be obtained with cast-iron or structural-steel bed plates for any form of driver—electric motor, diesel engine, or V-belt. They are regularly available in bronze-fitted, all-iron, or all-bronze construction. **Write or call: Goulds Pumps, Inc., 33 Black Brook Road, Seneca Falls, N. Y., for details on Figs. 3420-3423 pumps.**

•

Hydraulic Remote Control Has Design Improvements

An improved model of the Crown Hydra Trol remote control is now available for controlling hydraulic valves or other equipment. Having a positive stroke in both directions, it offers immediate synchronization of a hydraulics control system in either direction, according to the maker.

It does not depend on either outside power or spring return. It is self-contained for positive positioning of remote shafts, levers, and other equipment. **Write or call: Crown Control Div., Trimont Instrument Co., 3119-21 West Lake Street, Chicago 12, Ill., for details on remote control.**

TRADE MARK REG. U. S. PAT. OFF.

TIME TESTED MACCO GAS LIFT

Telephones:

ALICE
MO 4-4993 MO 4-5787
MIDLAND
MUtual 3-3936
ODESSA
FEderal 7-1943
VICTORIA
Hillcrest 5-1731 WJ-53395
BEAUMONT
5-1958 ZF-78424
HOUMA, LA.
2-1285 7728
NEW IBERIA, LA.
EMerson 4-2674
*LONG BEACH, CALIF.
NE 6-4666
*LOS ANGELES, CALIF.
LU 7-5261
*VENTURA, CALIF.
MI 3-4033
*TAFT, CALIF.
5-3148
*Calif. Rep. Emsco Mfg. Co.

MACCO OIL TOOL CO.

1521 PRINCE ST., HOUSTON 1, TEX.

UN 1-1253
HO 5-7585 MI 9-0747 MO 5-3841
MO 5-6809 UN 4-6441 HI 7-2396

Completely Air-Conditioned
Centrally Located
Adjacent Garage

BUSINESS and PLEASURE in TULSA means . . .

THE MAYO

LO 381 TULSA's world-famous HOTEL

Sun Oil Co. cracking unit at Marcus Hook, Pa.

Refineries Save $3,500,000 with B&W Carbon Monoxide Boilers

B&W Carbon Monoxide Boilers, in oil refineries, are compiling outstanding records. The seven units already on stream have produced, since 1953, savings of $3,500,000 in fuel costs. And every day they are in operation, they continue to save money. Each of these boilers is quickly paying for itself. No wonder a total of 15 units has been ordered to date.

Big fuel savings are achieved because B&W "CO" Boilers put sensible and combustible heat to work. In extended, sustained service they have proved their efficiency, reliability, and economy.

The cracking unit becomes independent of other steam sources. The boiler can be operated at all times, whether or not the cracking unit is on stream.

B&W engineers, experienced in meeting differing refinery conditions, can design a B&W "CO" Boiler to fit your specific requirements, for any steam pressure and temperature, for any size cracking unit. The Babcock & Wilcox Company, Boiler Division, Dept. OGJ 4, 161 East 42nd Street, New York 17, N. Y.

G-832-CO

BABCOCK & WILCOX

BOILER DIVISION

NEW PRINCIPLE STOPS COSTLY EQUIPMENT DAMAGE

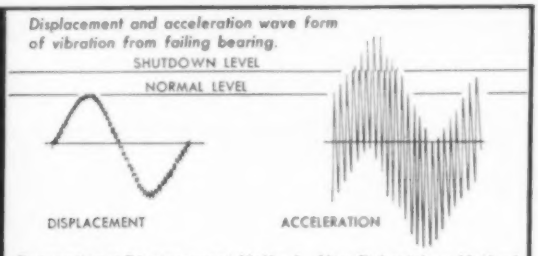
before it can start!

Model 65
Explosion proof

ROBERTSHAW VIBRASWITCH®
MALFUNCTION DETECTOR

Responds to Peak Acceleration

DETECTS DAMAGING MALFUNCTIONS THAT CAUSE ACCELERATION TO EXCEED NORMAL LEVEL



ANTICIPATES trouble such as bearing failure, imbalance, broken blades, bent shafts or any malfunction causing vibration or roughness to increase. *ACTUATES* alarm or shutdown when acceleration exceeds normal level. *SENSES* all types of shock and vibration. *RESPONDS* only to harmful vibrations—can ignore start-ups and temporary disturbances normal to operation. *OFFERS* resistance to rain, dust, oil and explosions in a variety of housings.

More than 150 corporations use VIBRASWITCH Detectors to protect equipment.

Demonstrations Anywhere in the U.S. by FIELDEN Vibration Experts. Call, write or wire NOW!

Mr. Controls

Robertshaw-Fulton CONTROLS COMPANY

FIELDEN INSTRUMENT DIVISION
Dept. L, 2920 N. 4th St., Philadelphia 33, Pa.

SHOWCASE . . .

New Literature

Condensate Units, Coolant Systems, and Pumps. This new 24-page catalog contains a diversified listing of pumps from a midget size that fits in the palm of the hand to large sealed automatic pumps of high capacity and many others especially designed for the handling of chemicals. **Write or call: S. Gelber & Sons, Inc., 5806 North Lincoln Ave., Chicago 45, Ill., for new 1957 24-page catalog.**

●

Digest of Specifications of Instruments and Controls manufactured by Hays Corp. is offered in this new 12-page condensed catalog. (Publication 57-687-297). Titled "Instrumentation and Control," the catalog covers instruments for pressure, flow, temperature, level, and gas analysis. **Write or call: Hays Corp., Michigan City, Ind., for Publication 57-687-297.**

●

Improved Gage-Glass Cleaning Tool. New Data Unit 301 describes and illustrates the method of operation of the Jerguson gage-glass cleaning tool which uses brushes to quickly and efficiently clean the inside of a liquid-level gage glass. **Write or call: Jerguson Gage & Valve Co., 80 Adams Street, Burlington, Mass., for Data Unit 301.**

●

Receding Chaser Pipe Machine Bulletin C-77-7 (12 pages) gives detailed data on the three sizes of Landis receding-chaser pipe machines which are designed to produce threads to meet the requirements for thread finish, thread form, lead, and taper set forth by A.P.I. standards. **Write or call: Landis Machine Co., Waynesboro, Pa., for Bulletin C-77-7.**

●

Rolling-Disk Kelly Drive. This new four-page folder describes and illustrates a kelly-drive body that can be used for either square or hexagonal kellys in various sizes merely by changing disks, grease retainers, and (for hexagonal kellys) the cages. Cut-a-way diagrams and photographs illustrate the different drives. **Write or call: Ideco, P. O. Box 1331, Dallas, Tex., for folder on kelly drives.**

●

Furnace Operating Manual 1957 edition (116 pages) describes and illustrates nine types of Iso-Flow furnaces. Each one is designed to meet specific conditions of service, pressure, and effi

ciency. The manual contains detailed information on: (1) the construction features of all Isoflow furnaces; (2) instrumentation and accessories; (3) initial startup; (4) furnace-operation procedures; (5) types of burners, their installation, and operation; (6) efficiency determination; (7) procedures for decoking; and (8) tube rolling and header assembly. **Write or call: Petro-Chem Development Co., Inc., 122 East Forty-second Street, New York 17, N. Y., for Iso-Flow furnace manual.**

●

Corrosion Tester Brochure. This new 16-page brochure is devoted to the Labline-Pure Corro-Dex, an instrument for determining rates of corrosion. The tester is available in two models: line-operated and portable battery-operated. Probes of such types as steel, nickel, monel, copper, brass, aluminum, and lead are available. The instrument applies a.c. current to the probe. It is said to eliminate all polarization and side effects. **Write or call: Labline, Inc., 3070-82 West Grand Avenue, Chicago 22, Ill., for brochure on Corro-Dex tester.**

●

Glass-Jet Perforators are discussed and pictured in new eight-page three-color Bulletin 304. This bulletin gives the advantages of the McCullough improved glass-jet perforators with steel strip carrier. Tables give the average penetration in single-string targets and the types and sizes of the perforators. **Write or call: McCullough Tool Co., 5820 South Alameda Street, Los Angeles 58, Calif., for Bulletin 304.**

●

Tube Cutter and Expander Catalog 81 (32 pages) contains specifications on Ideal tube cutters, expanders, and operating accessories. The new catalog demonstrates many product applications. It also furnishes tables of sizes, complete ordering information, and a list of nationwide and foreign distributor locations. All of this information is intended for quick reference. **Write or call: Gustav Wiedeke Co., 1833 Richard Street, Dayton 1, Ohio, for Catalog 81.**

●

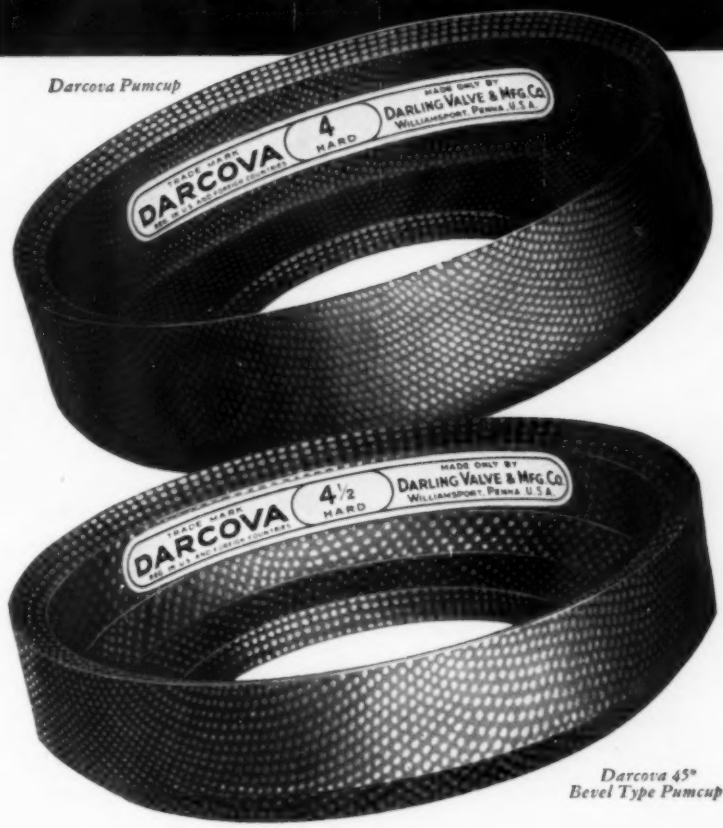
Industrial Mobile Housing Units for use as offices, testing laboratories, bunkhouses, seismograph units, or power plants are described in this new 20-page, 2-color catalog. It includes floor plans and interior design features of 17 industrial housing units. The catalog details in pictures, diagrams, and descriptive text the main features, various types of field units available, some uses

DARCOVA PUMCUPS

now available with

100% NYLON COMPOSITION

for HYDRAULIC CONTROLS, AIR CYLINDERS, RECIPROCATING PUMPS



DARLING Pumcups—long noted for unequalled efficiency and life in all kinds of cylinders—are now greatly exceeding their own performance records! The new 100% Nylon Composition, available *only* in Darcova Pumcups, does it!

Nylon Pumcups are made in sizes, types and textures exactly right for your particular equipment—ready *now* to give you unprecedented piston packing performance!

Write for helpful data Bulletin No. 5503.

DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

DARCOVA

THE ORIGINAL COMPOSITION CUP

TRADE MARK

PUMCUPS

Field party on survey for proposed Canyon Dam on Texas' Guadalupe River.

W&T SURVEYING ALTIMETERS SPEED HYDROLOGIC STUDY OF RESERVOIR BASIN

TYPE FA-176

A ground-water and geologic survey, involving water table isograms for 400 square miles adjoining the proposed Canyon Dam Reservoir on Texas' Guadalupe River, recently was completed in 35 days. Despite difficult terrain and maximum relief of 1000 feet, over three hundred spot elevations were taken during this period. The speed with which this work was done is attributed to the use of the two-base method of altimetry employing three Wallace & Tiernan Type FA-176 Surveying Altimeters.

Technical data on the FA-176 Altimeter include: **Range** — any interval of 2000' up to max. limit of 5000'; **Accuracy** — 2.0'; **Sensitivity** — 0.5'; **Scale Length** — 20"; **Dial Size** — 8½" dia.

For details on FA-176, send for Bulletin No. TP-7-A

WALLACE & TIERNAN INCORPORATED

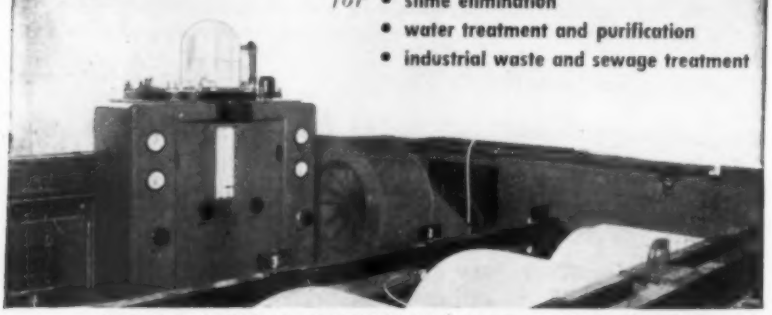
25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

In Canada, Wallace & Tiernan, Ltd. — Toronto

A-117

CHLORINATORS and CHEMICAL FEEDERS

for
- slime elimination
- water treatment and purification
- industrial waste and sewage treatment



WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

CD-41

of units now in the field, and a list of major companies which have used the Spartan housing to solve field-housing problems. **Write or call: Industrial Div., Spartan Aircraft Co., 1919 North Sheridan Road, Tulsa, Okla., for catalog on mobile housing.**

•

Process Refractometer for monitoring and control of petroleum and petrochemical processes is the subject of new eight-page Bulletin 1833. The bulletin includes sections that explain and illustrate: (1) what the refractometer measures, (2) how it operates, (3) its application to fractionator and blending control and measurement, and (4) its construction and operating features. **Write or call: Consolidated Electrodynamics Corp., 300 North Sierra Madre Villa, Pasadena, Calif., for Bulletin 1833.**

•

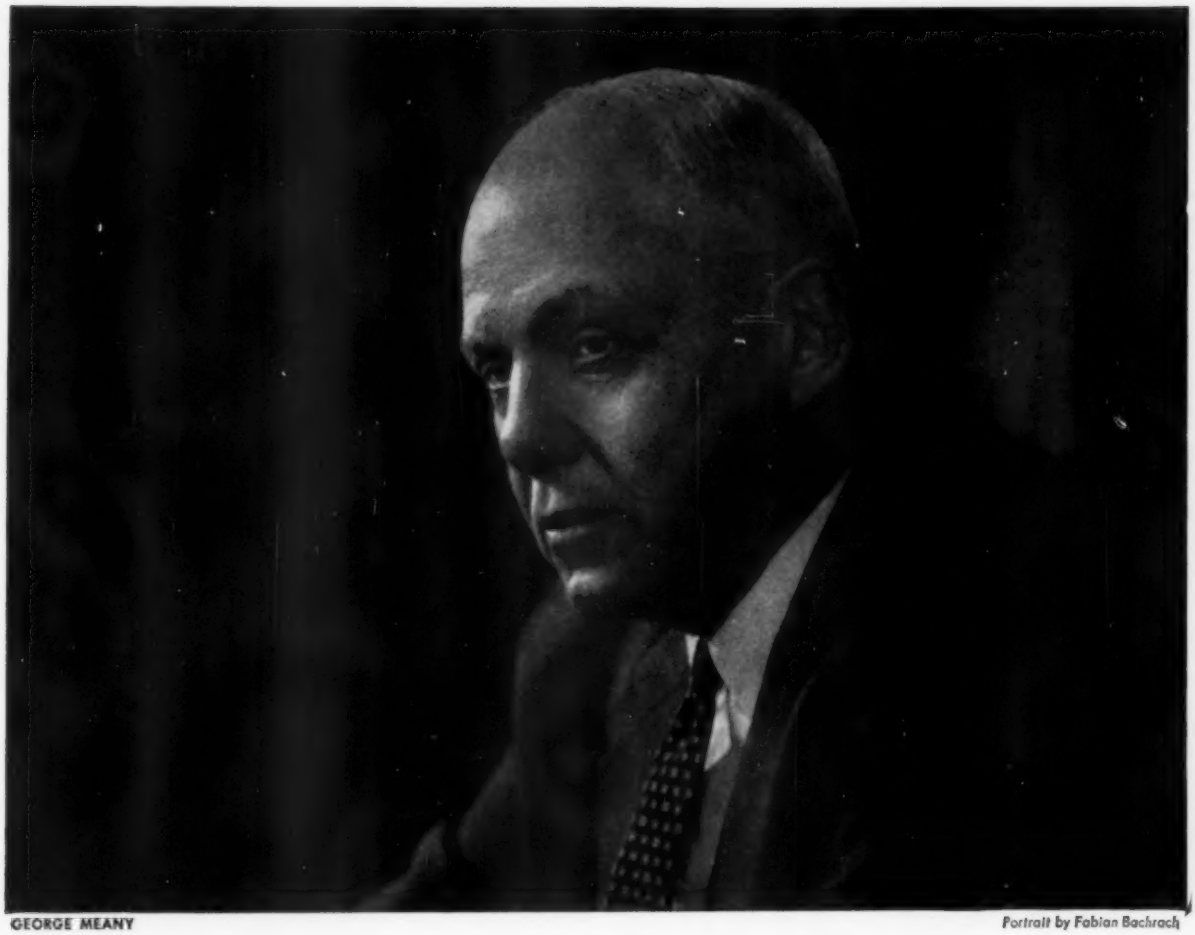
pH Electrodes Bulletin. New eight-page Bulletin 86-5 features Beckman electrodes for laboratory and portable pH meters. The bulletin, made up in simplified chart form, is completely indexed and illustrated. It is designed to guide users in selecting correct pH electrodes. The new revision is one of a five-bulletin package which also includes information on the Zeromatic, Pocket pH, and other Beckman pH meters. **Write or call: Scientific Instruments Div., Beckman Instruments, Inc., Fullerton, Calif., Bulletin 86-5.**

•

Mortar Manual. This new booklet, titled "Lumnite Cement Mortar Manual—Gun-Applied Linings-Masonry," contains complete information on mortar preparation, placing procedure, and general instructions for gun-applied linings in oil refineries and similar plants. An appendix contains information on selected aggregates, thermal conductivities of Lumnite concretes, and strength curves. A bibliography on refractory concrete has been included for easy reference. **Write or call: Universal Atlas Cement Co., 100 Park Avenue, New York 17, N. Y., for mortar manual.**

•

"How Industry Profits With Viking Pumps" is the title of this new eight-page pamphlet providing application material on Viking pumps for petroleum products, including L.P.G. and many types of chemicals as well as all types of asphalts, tars, and road oils. It points out that the pumps are available in 750 cataloged models and in many special units. **Write or call: Viking Pump Co., Cedar Falls, Iowa, for pamphlet on pumps.**



GEORGE MEANY

Portrait by Fabian Bachrach

"How can I save"..."Are my savings safe?"

"These two questions are uppermost in the thoughts of the average wage earner.

"Today, some 8 million American wage earners in thousands of industries are finding the answer to both questions in United States Savings Bonds. They are taking advantage of the Payroll Savings Plan to invest in Savings Bonds regularly and automatically where they work.

"Encouraging the wage earner to cultivate the good habit of personal thrift is important to our nation. That's why America's trade unions are giving their wholehearted, active cooperation to the U. S. Savings Bonds program. It's good for our people. It's good for our country."

GEORGE MEANY, *President*
American Federation of Labor—
Congress of Industrial Organization

Every executive can help his employees to help themselves. If your company does not have the Payroll Savings Plan, or if employee participation in the existing plan is less than 50%, your State Director, U. S. Treasury Department is ready to help you build enrollment. Write today to Savings Bond Division, U. S. Treasury Department, Washington, D. C.

The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

The Oil and Gas Journal
Tulsa, Oklahoma

EQUIPMENT MEN . . . in the News

Tusco Elects Bozeman as Executive Vice President

J. W. BOZEMAN

The election of James W. Bozeman of Houston as executive vice president of Tusco Corp., formerly Tubular Service & Engineering Co., has been announced by W. H. Hopkins, president of Tusco. Bozeman will be active in the management of Tusco's oil-field-service companies, its building-material division and its Navion aircraft division. He was formerly president of Tuboscope Co., a Tusco subsidiary, and will continue as chairman of the board of Tuboscope. President of the latter company is B. H. Pickard.

Tusco Corp. is the parent company of Tuboscope, Tuboscope Co. International, Tubular Processing Co., Tube-Kote, Inc., Aluminum Products Co., Kesco Products, Inc., Rubin Glass & Mirror Co. and Navion Aircraft Division.

Other officers besides Hopkins and Bozeman are E. G. Amundsen, vice president; J. L. McConn, treasurer; and Thad T. Hutcheson, secretary.

Librascope Appoints Three Firms as Representatives

Electrodesign, with offices in Montreal, Quebec and Toronto, Ont., has been appointed eastern Canadian representative for Librascope, Inc., Glendale, Calif. Lowry Dietrich Co., with offices in Pittsburgh, Pa., Cleveland and Dayton, Ohio, will represent Librascope in Ohio, West Virginia, Kentucky, and the western portion of Pennsylvania. Engineering Services Co. of Kansas City and St. Louis, Mo., will handle the Librascope line in Nebraska, Kansas, Missouri, Iowa, and the lower portion of Illinois.

The appointment of these firms was made by R. E. Hastings, general manager of Librascope's commercial division.

Schlumberger Assigns Location, Sales Managers

A. O. Phares, formerly manager at Sidney, Neb., has been moved to Houma, La., to assume charge of the Schlumberger Well Surveying Corp. district office there. The new manager at Newcastle, Wyo., is C. G. Rogers. H. H. Ham has been promoted to district manager at Buras, La., and the new manager at Golden Meadows, La., is L. W. Lusk.

W. H. Hartsell has been promoted to sales manager for the South Louisiana division with headquarters in New Orleans. Sales manager for the North Louisiana division at Shreveport is J. A. Williams.

Assuming duties as sales engineers are E. B. Boone at Snyder, Tex.; K. N. Thomas at Lake Charles, La.; and F. M. Mullins at Lafayette, La.

Ideco Personnel Changes Enlarge Dallas Staff

Jack Hilder has been appointed assistant to Ideco, Inc.'s Vice President Gordon Wilbur. Hilder, who joined

JACK HILDER

CLYDE BLOSS

Ideco in 1948, will manage the production of Full-View masts and an enlarged line of Ideco slush pumps. Johnny McPeak, assistant manager of the Full-View mast department, will have primary responsibilities in production control of Fu'l-View and Junior Full-View masts and substructures. Also in that department, Ray Klingler has been transferred from the Ideco technical service department in Mexico City to the Dallas headquarters to assist in the production and inspection of masts.

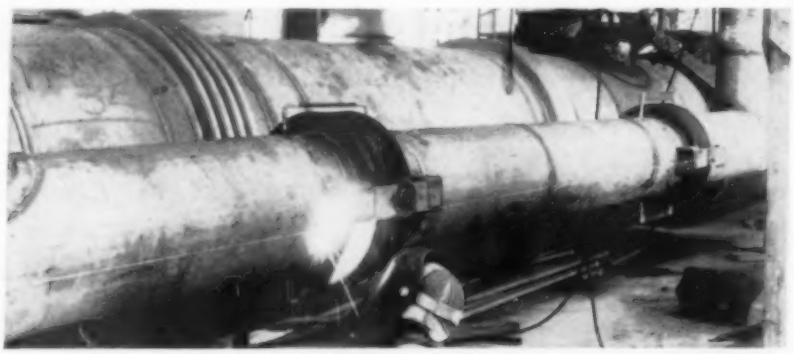
Clyde Bloss, previously an Ideco service representative, has been appointed assistant to Central Service Manager J. C. Young. Turgut Ulug, technical service engineer, has been transferred from the Houston office to assist Ideco Vice President E. F. Shiels in domestic sales and Hilder with the Ideco pump program. Bob Alderdice

Badger Expansion Joints Used in Texas Butadiene Plant

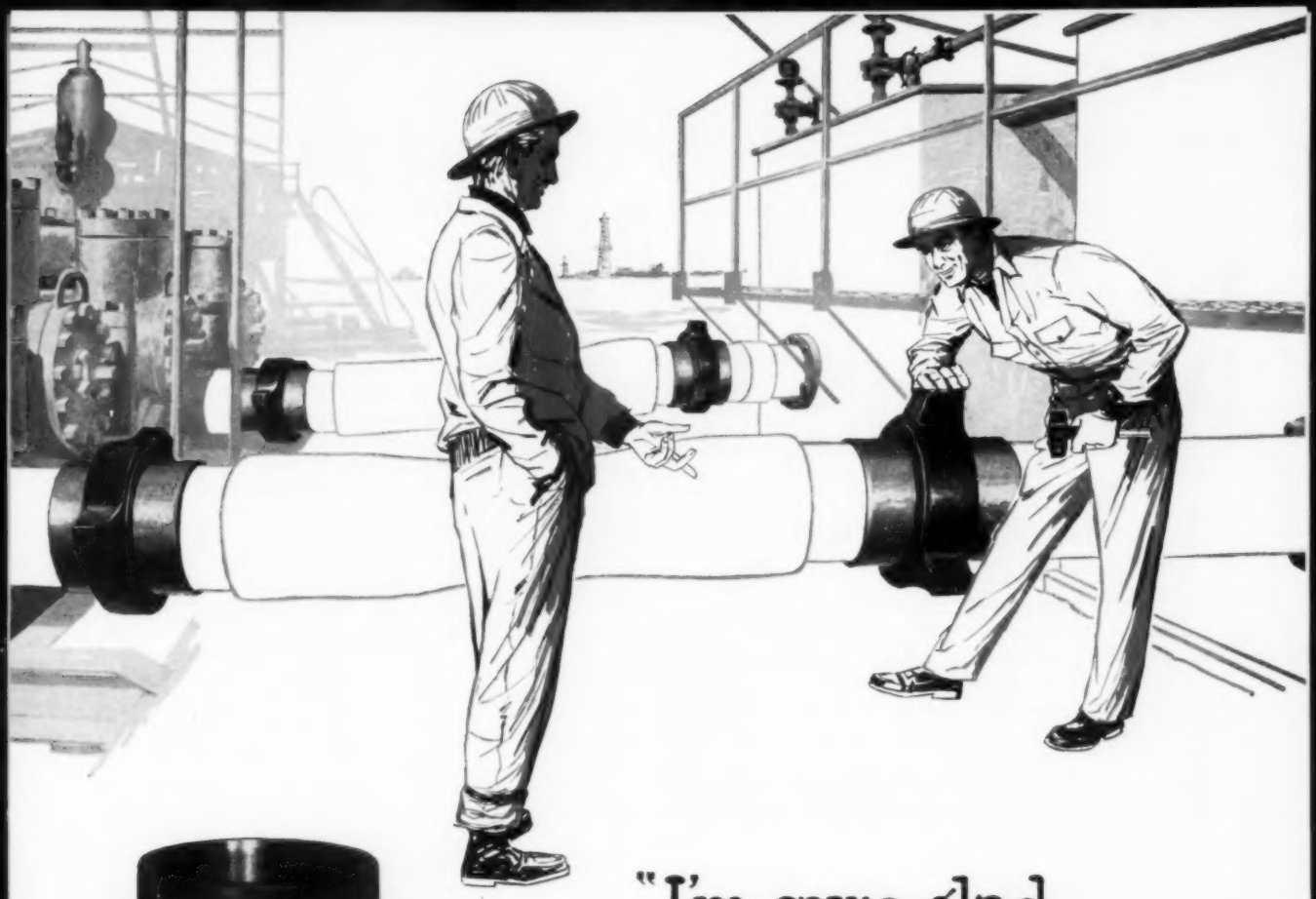
Badger Manufacturing Co.'s new expansion joints are about to go on stream at Texas Butadiene & Chemical Corp.'s Lyondell plant near Houston. Principal products made are butadiene and aviation gasoline; principal charge is normal butane.

The new plant is using 188 of BMC's new-design, service-rated Series 50 (low pressure) joints ranging in size from 14 to 72 in. The curvilinear corrugation design resulting in a more uniform movement per corrugation is based on correlation between the shape, height and pitch of the corrugations.

This correlation was established by Badger research department from extensive testing and a study of previous service records. The natural, all-curve shape results in lower flexing stresses and increased flexibility. The engineering features incorporated in the curvilinear corrugations offer this better equalization of movement even without reinforcing rings. Because of these features, longer cyclic life is assured. Weight is 50 per cent less than conventional joints.



Large line in back is the air-in-air-out-product out line. On this line, located just below the seven reactor vessels, twelve 48-in. stainless steel joints handle temperatures about 1,150° F. and pressures 35 psig. The small line is in the evacuation system. There are fourteen 16-in. joints on this line handling the same temperatures and pressures of the larger line.



"I'm sure glad we've standardized on **WECO** unions!"

Standardization with Weco saves the time and trouble of searching for unions that match and mate when you rig up. The interchangeability of unions in the same size and pressure rating eliminates the replacement of complete unions . . . assures perfect leak-proof protection on all rig connections.

When you fully appreciate how much time and expense you can save, you will agree that it is wise to standardize with Weco Unions.

U-7-56

WECO®

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

Division of CHIKSAN COMPANY *a subsidiary of*
FOOD MACHINERY AND CHEMICAL CORPORATION

Buying globe stop valves?

REDUCE WEAR, PRESSURE DROP

with Edward "streamlined flow"!

IN AN ORDINARY globe valve, sharp turns cause wear-producing turbulence and excessive pressure drop. Edward forged steel inclined stem valves with streamlined flow cut turbulence, reduce pressure drop as much as 50%. Flow is eased through the valve with no sharp changes of direction. Wear on body, disk and seat is much less, especially in higher pressure-temperature applications. Whether for steam, water, oil, gas or chemical services, Edward valves are built for long, trouble-free life. To cut maintenance costs and replacement inventories, always specify Rockwell-Built Edward Valves. They're the choice of operators all over America.

JUST CHECK THESE EXTRA EDWARD FEATURES:

- Forged steel body and bonnet!
- Stainless steel EValloy stem resists corrosion!
- Hardened EValloy stainless steel seat and disk!
- Interchangeable parts cut inventories!
- Swivel disk prevents seat galling!
- Positive backseat permits packing under pressure!
- Swing gland bolts make repacking easy!

Rockwell-built Edward forged steel inclined stem valve with *streamlined flow* . . . sizes from ¼" to 2". Ratings to 1500 lbs at 850 F, 3600 lbs W.O.G.

OILFIELD SUPPLIERS: Contact your nearest Edward oilfield representative—or write us direct—for prices and information on stocking Edward Valves. Ever-growing preference for Rockwell-built Edward Valves assures you a steady profit.

Edward Valves, Inc.

subsidiary of ROCKWELL MANUFACTURING COMPANY

1212 WEST 145th STREET EAST CHICAGO, INDIANA

has joined the Ideco advertising department as assistant to Advertising Manager R. M. Perdue. These personnel changes were announced by George W. (Jack) Walton, president of Ideco.

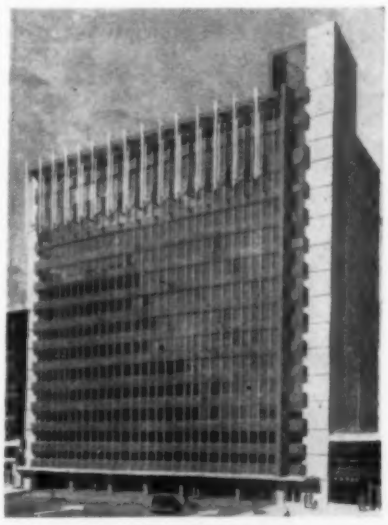
Oklahoma City Petroleum Club to Open August 1

The new $400,000 Petroleum Club of Oklahoma City will be opened on August 1, according to the club's president, Harry J. Schafer, president of Schafer Drilling Co.

Situated on the 13th and 14th floors of Liberty National Bank & Trust Co.'s 15-story parking facility, the sumptious club will occupy a total of 24,000 sq. ft. In addition to kitchens, office space, ladies and men's lounges, and other required facilities, the club will incorporate a main lounge, a main dining room and dance floor with a variety of smaller dining rooms for private parties and a snack room and a large banquet room occupying a major part of the 13th floor.

An attractive feature of the club will be a 12,000-piece mural mosaic stratigraphic cross-section of the Oklahoma City field, which will dominate the main lounge area. An overhead ramp will connect the 14th floors of the Petroleum Club and the Liberty National building.

Oklahoma City's petroleum club now has 1,450 charter members toward its goal of 1,500 members. Manager of the new club will be J. E. Halloran, formerly manager of The Dallas Club. He has already established temporary offices in the Liberty National building and is recruiting the necessary personnel.



The Petroleum Club of Oklahoma City occupies the 13th and 14th floors of this new Liberty National Bank & Trust Co. parking facility in Oklahoma City.

Alco Names Houston Oil Field Equipment Sales Mgr.

T. L. FONTAINE

T. L. Fontaine, Jr., has been appointed manager of oil-field equipment sales for the Houston district of Alco Products, Inc., according to T. Gupton, Houston district manager. Fontaine was with Atlas Engineering Works 2 years, joining Alco in 1953. For 2 years he was in the spring and forge division and has been in oil-field sales for the past 1½ years.

Howco Reelects Directors, Officers at Annual Meeting

At the annual meeting of stockholders of Halliburton Oil Well Cementing Co. held in Duncan, Okla., the following were reelected as directors of the company: Erle P. Halliburton, Robert J. Bradley, George H. Bruce, Logan D. Campbell, A. E. Chester, Harold Decker, E. R. Filley, R. G. Kelly, Donald N. McDonnell, Loren B. Meaders, Frank A. Morgan, Joe H. Russell and Joseph A. Thomas.

At the stockholders meeting L. D. Campbell, vice chairman of the company, and L. B. Meaders, president, reported that foreign operations had shown a good growth during the first half of the year but that decline in drilling and increased costs had affected domestic operations; that estimated consolidated net revenue for the first 5 months showed an increase of 2 per cent over the same period of 1956, net income showed a decrease of 16 per cent, and earnings per share were $1.81 as compared to $2.14 based on 3,630,000 shares presently outstanding.

The board of directors met immediately following the stockholders meeting and declared a regular 1957 third-quarter dividend of 60 cents per share on the 3,630,000 shares of issued and outstanding common stock. Directors reelected all officers of the company to serve for the ensuing year and named Edwin L. Paramore, formerly regional manager, as regional vice president.

Officers who were reelected are: Erle P. Halliburton, chairman; Logan D. Campbell, vice chairman; Loren B. Meaders, president; Richard G. Kelly, senior vice president; William D. Owsley, senior vice president; Harry P. Conroy, vice president in charge of field operations; Ralph R. Emery, vice president for foreign operations and export sales; J. Grover Kilgore, vice president

STRONG, COMPACT AND LIGHTWEIGHT

The Coffing Mighty Midget Puller

Compact and lightweight, the Coffing Mighty Midget Pullers are handy lifting tools for all types of industries. The 1000 lb. capacity model weighs but 9½ lbs. and requires only 40 lbs. of handle pull. The 500 lb. model weighs 6½ lbs. and requires only a 28 lb. pull for full rated capacity.

The handle can be operated as a crank for fast lifting, or it can be used as a lever for short pulls, or for working in cramped quarters. Should the puller be overloaded, the "safety valve" handle will give before any load bearing part fails.

For full information on this compact, light and inexpensive lifting tool, consult your favorite supply store, or write for Bulletin MP.

DUFF-NORTON Coffing Hoist

DIVISION OF DUFF-NORTON COMPANY
818 WALTER STREET DANVILLE, ILLINOIS

Ratchet Jacks, Screw Jacks, Hydraulic Jacks, Special Worm Gear Jacks, Ratchet Hoists, Electric Hoists, Load Binders, Spur Gear Hoists

BAKED-ON PLASTIC COATINGS

"PLASTICAP" SAVES $10,000.00 FIRST YEAR ON ONE SOUTH TEXAS GAS LIFT WELL

Typical of the savings possible with Plastic Applicators' baked-on plastic coating is the experience of this South Texas producer:

A gas lift well, 4,770 feet deep, was making 3,500 bbl./day of fluid, of which 3,450 bbl. were salt water. It was necessary to pull and replace an average of 65% of the tubing string every 90 days. This costly operation under these highly corrosive conditions continued for five years until the well was equipped with "Plasticap B" baked-on plastic coating. During the year this installation has been in service, not one pulling job has been necessary, and there are no signs of tubing failure to date. Savings in material, four pulling jobs and lost production exceed $10,000.00 for the year.

This story is repeated many times over in the long list of successful "Plasticap" installations throughout the Southwest. Regardless of your location or the nature of your production problem, if corrosion or paraffin deposition are factors, consult Plastic Applicators for the fast, economical solution.

PLASTIC APPLICATORS, INC.

HOME OFFICE AND PLANT: P. O. Box 7631, Houston, Texas. Phone UN 9-2491
BRANCH OFFICES AND PLANTS: P. O. Box 388, Harvey, La. Phone FIllmore 1-1636
P. O. Box 2749, Odessa, Texas Phone EMerson 6-4491
SALES OFFICES—TEXAS: Houston, Corpus Christi, Dallas, Midland, Odessa. LOUISIANA: Lafayette, New Orleans, Harvey.

for sales and advertising; Wilfred B. Tapper, vice president for electrical well services; Dwight R. Yager, regional vice president; Robert O. Brown, vice president and general counsel; Richard M. Hansen, vice president for manufacturing; Hosea P. Hern, regional vice president; Marvin K. Brummett, secretary; Gervase D. McEnroe, treasurer; John P. Harbin, controller and assistant secretary; and Clint M. Roberts, assistant treasurer.

Welex to Serve East Texas Through New Kilgore Office

Welex Jet Services, Inc. has opened a new district operating office in Kilgore, Tex., and will offer the company's full line of jet perforating and other wireline services to operators throughout the East Texas area, according to J. B. Vaughan, sales vice president.

Billy Crice will be in charge of the Kilgore district. He moved to Kilgore from the company's Beaumont district where he had been assistant manager and sales engineer for the past 3 years.

Services available through the Kilgore district include jet perforating in casing and open hole, through-tubing perforating with the Welex development, the Swing-Jet; radioactivity innovation, the formation fracturing tool, or more commonly known by oil men as the Bear Gun; and other wireline services.

Ten Identical Pumps Work For Apex Petroleum

These ten identical oil-field pumping units are busily operating at Wilmington, Calif., on property owned by the Los Angeles Board of Harbor Commissioners. Drilled directionally from this single location, the actual wells are widely separated and are bottomed under various warehouses, industrial plants, and channels of the area. Underground spacing allows a least five acres for each well, as part of a 216-acre lease held by Apex Petroleum Corp., Ltd., of Long Beach. The wells average 4,000 ft. in depth.

Denison University Awards R. C. Fish Honorary Degree

Ray C. Fish was awarded an honorary degree of Doctor of Business Administration at commencement exercises of Denison University, Granville, Ohio. Dr. A. Blair Knapp, president of Denison University, noted that the significant contributions of Fish in the gas-transmission industry were responsible for conferring of the honor.

Fish, chairman of the board of Fish Engineering Corp. and affiliated companies, has participated in every major transcontinental gas - transmission project since the end of World War II. The Houston-based firm designed and built the Transcontinental Gas Transmission system, the Texas-Illinois line, and most recently the Pacific Northwest Pipeline Corp. gas - transmission system.

Fish recently resigned as chairman of the board of Pacific Northwest Pipeline when the firm merged with El Paso Natural Gas. He is a director of Bank of the Southwest, El Paso Natural Gas Co., Transcontinental Gas Pipe Line Corp., Spokane Natural Gas Corp., and Northwest Production Corp.

Hydrocarbon Construction Adds Jones to Staff

S. J. Jones, Jr., has been appointed as a staff member of Hydrocarbon Construction Co. with headquarters at its home office in Houston. Jones is well known in the Gulf Coast area in the industrial construction field, having been associated in the work for the past 20 years as a supervisor and an executive in the building of refineries, chemical plants, and similar industrial projects.

Larsen Named Assistant To Mandrel President

Chester Larsen, Jr., has been appointed as assistant to George Quist president of Mandrel Industries, Inc., Houston. Mandrel Industries, manufacturer of industrial electronic instruments, has two divisions in Houston: Electro-Technical Labs, manufacturers of specialized geophysical exploration equipment; and Electric Sorting Machine, manufacturers of precision photoelectric color-sorting machinery. A third division, Greenleaf Manufacturing Co., St. Louis, manufactures precision aircraft and missile instruments.

Larsen, prior to coming to Mandrel, served with Northrop Aircraft Co. and A-C Spark Plug Division, General Motors.

Los Angeles Nomads Induct Three New Members

New members of the Los Angeles Chapter of Nomads were inducted into the chapter recently. Flanked on the left by Bill Brooks of Byron Jackson Tools, Inc., vice president and ritual master, and on the right by Art Marshall of H. C. Smith Oil Tool Co., member of the induction committee, the new members are: Elvin K. Wilson, Shaffer Tool Works, regular member; John P. Davis, Jr., Technical Oil Tool Corp., regular member; and Peter S. Carberry, Petroleum Week, associate member.

Guin Heads National Tank's New Southwest Division

WARD E. GUIN

Ward E. Guin, Oklahoma City, has been named manager of a new realigned division, according to C. G. Wells, executive vice president of National Tank Co., Tulsa. The Oklahoma City division consists of Oklahoma, Kansas and the Texas Panhandle.

Lynn W. Burrus, with headquarters in Oklahoma City, replaces Guin as Oklahoma district manager. Joe L. Wells, Pampa, Tex., will be district manager of the Texas and Oklahoma Panhandles and the Hugoton area of western Kansas.

Sam Mays will continue as district manager for Kansas, except the Hugoton area, with headquarters in Great Bend.

A new branch has been opened at Liberal, Kans., with George T. Powers, formerly sales engineer at Oklahoma City, as branch manager.

Cameron Moves Brown to New Orleans City Sales

Homer E. Brown has been transferred from Houston sales liaison director to the New Orleans city sales staff of Cameron Iron Works, Inc., Houston.

Brown has been with Cameron 22 years. He has had considerable experience selling and servicing Cameron valves, blowout preventers, christmas trees and drilling control equipment, and has represented the company in New York, London and West Texas.

Jack Kaltenback has been named to succeed Brown as Houston sales liaison director.

Oilwell Names Oldaker, Azbell to Eastern Posts

Ralph G. Oldaker has been named as manager of the United States Steel Corp.'s Oil Well Supply Division store at Newark, Ohio, and Clarence H. Azbell as field representative at Newark, according to C. H. Maynard, eastern area manager of the division.

Oldaker, who was employed in 1936 by Oilwell, was appointed store manager at Newark in 1944, and in 1948 was named field representative. Azbell joined the division in 1948 at Newark.

ACF Establishes Advanced Products Division

A new operating division of ACF Industries, Inc., the advanced products division, was established recently as part of a major realignment of the company's products and plants, according to James F. Clark, president.

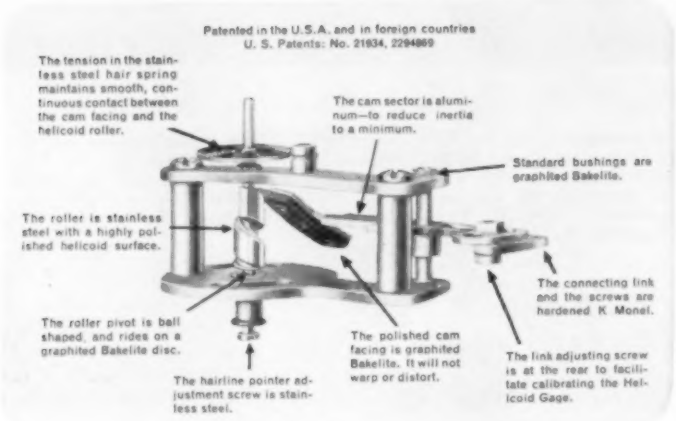
Manufacture of products for the petroleum, gas, chemical and nuclear energy industries—such as pressure vessels, processing equipment and tanks —will be concentrated in the new division. It also will specialize in pressed-metal items, special weldments, tank cars (except underframe), aluminum and new metals fabricated products.

Personnel and facilities of the ACF plants in St. Charles, Mo., and Milton, Pa., will be assigned to the new divi-

ACCO
Helicoid Gage
U.S.A.

Nothing but the best in gages for working pressures from 30" vacuum to 10,000 p.s.i.

These details of Helicoid gage design assure longer life and enduring accuracy


Patented in the U.S.A. and in foreign countries
U. S. Patents: No. 21934, 2294869
The tension in the stainless steel hair spring maintains smooth, continuous contact between the cam facing and the helicoid roller.
The cam sector is aluminum—to reduce inertia to a minimum.
Standard bushings are graphited Bakelite.
The roller is stainless steel with a highly polished helicoid surface.
The connecting link and the screws are hardened K Monel.
The roller pivot is ball shaped, and rides on a graphited Bakelite disc.
The polished cam facing is graphited Bakelite. It will not warp or distort.
The link adjusting screw is at the rear to facilitate calibrating the Helicoid Gage.
The hairline pointer adjustment screw is stainless steel.

The superiority of Helicoid Gages is most evident in severe service—wherever a gage is subjected to violent pressure pulsations or severe mechanical vibrations.

The *sustained accuracy* of Helicoid Gages over *millions of cycles* is explained by the details of design and construction of the Helicoid movement shown above. Such Helicoid features—protect against wear and corrosion and assure sensitivity, sustained accuracy and trouble-free operation.

Easiest adjustment and calibration

Only Helicoid Gages have the external pointer adjustment pictured here. The Helicoid type adjustment cannot be jarred out of position.

Calibration of Helicoid Gages is accomplished easily, without removing dial or pointer, because the link adjusting screw is at the rear of the system.

Tubes built for millions of pressure pulsations

To fit the wide range of applications, Helicoid Bourdon tubes are available in four materials—alloy steel, K Monel, stainless steel and phosphor bronze.

All Helicoid tubes are made from seamless tubing and are carefully designed to give maximum torque and minimum stress. When used within the dial range, they will withstand many millions of pressure pulsations and will not stretch, leak or crack.

For complete information on the Helicoid line of gages write for **Catalog G-52**

Helicoid gives you all these features at prices that are competitive in the quality gage field.

Helicoid Gage Division
AMERICAN CHAIN & CABLE

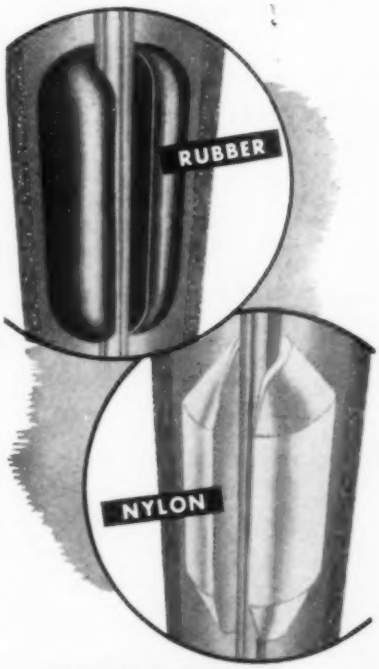
929-A Connecticut Avenue • Bridgeport 2, Connecticut

ACCO TRADE MARK

TROUBLE-FREE COST-SAVING SUCKER ROD GUIDES

With thousands upon thousands in use throughout every oil producing area, Oil States Rod Guides have proved to be the easiest to apply with their "SNAP-ON" feature . . . most trouble-free . . . and best for cutting operating costs. Check these features:

- ★ CENTER RODS IN TUBING
- ★ INCREASE ROD & TUBING LIFE
- ★ REDUCE FRICTION
- ★ DAMPEN OUT VIBRATION
- ★ LESS STROKES PER MINUTE
- ★ LENGTHEN PLUNGER TRAVEL
- ★ PREVENT METAL-TO-METAL CONTACT IN TUBING
- ★ LOWER POLISH ROD LOAD
- ★ SAVES COUPLING WEAR



AVAILABLE THROUGH YOUR SUPPLY STORE

Oil States

OIL STATES RUBBER CO.
ARLINGTON, TEXAS

sion. Rudolph Furrer, ACF vice president of manufacturing and engineering, will serve also as president of the new division. He came to ACF in 1947 as vice president and director of special products and is now a director of the company.

Weatherford Names Control Manager, Sales Engineers

R. D. HUNTER

Russel D. Hunter has been appointed assistant district control manager of Weatherford Oil Tool Co. Sales and service engineers appointed are Joe F. Pontremoli in the western division with headquarters at Odessa, Tex.; Lloyd William Glick in the Casper, Wyo., district; and Warren William Delahoussaye in Laurel, Miss.

Previously, Hunter was with Armour & Co. 7 years as a department head and held various posts prior to that. Pontremoli previously was with Loffland Bros. as a driller and with Phil A. Cornell, Inc., and Associated Oil Field Rental Co. as a sales representative. Glick was previously employed by Baker Oil Tool Co. and Halliburton Oil Well Cementing Co. Delahoussaye previously was a mud engineer with Sun Oil Co. in Venezuela and a drilling and production engineer with Manobi Exploration Co. in Ecuador.

Enardo Names Longhorn as Houston Area Distributor

Longhorn Supply Co., Houston, has been appointed Houston area distributor for Enardo Manufacturing Co., Tulsa. Longhorn will stock a full line of Enardo equipment, which includes valves, fittings and other oil field specialty items.

Hammond Iron Works Names Fino as Chief Engineer

Alex F. Fino has been appointed chief engineer of Hammond Iron Works He has been with the company since 1940. Fino has had the principal responsibility for the design and development of various Hammond patented products including the Tubeseal floating roof, Dialift, Diafloat and other oil-conservation devices.

Hammond Iron Works has fabricating plants in Bristol and Warren, Pa.; Birmingham, Ala.; Provo, Utah; Casper, Wyo., and field-erection crews throughout the world.

J&L Supply Transfers Lamb, Promotes Windham

Luther M. Lamb, formerly store manager at Jones & Laughlin Supply Division's Rodessa, La., store has been transferred to El Dorado, Ark., to serve as store manager; Samuel A. Windham, formerly a storeman at Rodessa, has been promoted to store manager at that location, according to A. G. Bastian, manager, field sales division of J & L.

Lamb joined J & L in 1937 as a storeman. Windham was employed by J & L in 1952 at Oil City, Miss., and was transferred to Rodessa and promoted to storeman-general in 1955.

Cosasco Moves Into New Headquarters at El Monte

Cosasco division of Perfect Circle Corp. has moved into new headquarters at El Monte, Calif. The new plant has four times the floor space of the former location in LaCanada and is more convenient to transportation and related industries.

A need to expand production facilities dictated the move, according to Jay P. Gould, general manager and founder of the predecessor company, Corona Oil Specialties & Service Co. A new location for the firm's export office in Long Beach, under Roland E. Smith, was also announced.

The Cosasco division was formed last year when Perfect Circle Corp., piston ring manufacturers of Hagerstown, Ind., acquired the company.

Key personnel of Cosasco, in addition to Gould, are: D. M. Etter, sales manager, and Leland Auer, manager of engineering.

Continental-Emsco Store, Field Appointees Named

Continental-Emsco Co. has announced the following changes in store managers: Donald F. Woods was promoted to store manager at New Harmony, Ind. John W. Bohm was transferred from New Harmony to Salem, Ill.; J. W. Ady is now store manager at Drayton Valley, Canada; Frank Ellis is store manager at New Iberia, La.; Emery Lasster will be store manager at Houma; Richard L. Cavnar has been appointed store manager at Shreveport, and Robert H. Pace will move into the Post, Tex., outlet as store manager.

Appointed as sales representatives are Donald M. Butler, Farmington, N. M.; W. G. Forsyth, Corpus Christi, Tex.; Freddie Vincent, New Orleans; Henry A. Lee, Houston; and Gary K. Ashmead, Lafayette, La.

Promoted to field salesmen are John E. Campbell, Estevan, Canada; Carmen R. Fairman, Drayton Valley, Canada; Ralph J. K. Oslund, Edmonton, Canada; M. S. Holleman, New Iberia; E. J. Duge, Victoria, Tex.; Elmo J. Fruge, Eunice, La.; Billie R. McKinney, Jena, La.; Jack N. Smith, Refugio, Tex.; William H. Beck, Liberal, Kans.; J. B. McLeroy, Hobbs, N. M.; Albert N. Taylor, Abilene, Tex.; Jimmie W. Porter, Liberal; W. Lee Hiler, Drumright, Okla.; John R. Lendvoy, Esteven; Earnest I. Ogilvie, Perry, Okla.

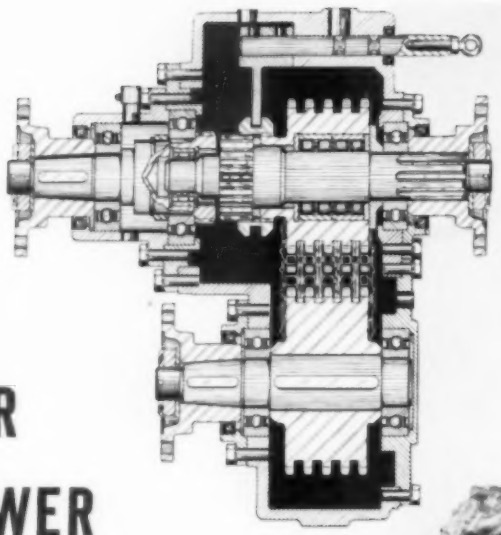
Roland B. Bowden, George R. Nichols, and Charles W. Lee have been appointed as D+B specialists and Kenneth G. Underwood and Robert L. Whelchel as production machinery specialists. Lee will headquarter at Abilene, Bowden will work out of the Pampa, Tex., store, and Nichols will be based at Hobbs. Whelchel will work from Continental-Emsco's Lafayette district office. Underwood will headquarter in Lindsay, Okla.

Graver Tank's Centennial Salutes Oil Industry

Graver Tank & Manufacturing Co., Inc., which was building tanks before oil was discovered in America in 1859, is celebrating its 100th anniversary. Highlighting the coast-to-coast celebration is a recorded message from Graver's president, Jalmer E. Swanson, who is the company's oldest employe in terms of service. The message is to be played in the Indiana, California, Delaware, Oklahoma and Texas production plants.

In his message, Swanson relates Graver Tank's success to the growth of the petroleum industry which Graver Tank has served for 98 years. He points out that the extension of petroleum products from one—kerosine—to all the gasolines, fuels, lubricants and chemicals that the oil industry produces today provided the basic market for Graver tanks and vessels. "In a sense," Swanson says, "we owe what we are to this industry."

Graver's hundred years date back to the time in 1857 when William Graver, then only 15, joined with his brother Michael in a backyard business venture in Pittsburgh, Pa. Their product was tanks and iron plate work. With the discovery of oil in Pennsylvania 2 years later, a ready market developed for crude oil tanks and kerosine stills. In 1872 William Graver branched out with a shop of his own and in 1883 moved it to Chicago.



FOR POWER TAKE-OFF... AND CHAIN PULL-DOWN

The George E. Failing CFD-1 Combination Rig is equipped with

DIAMOND ROLLER CHAINS

The method of applying correct drilling pressure is so important in the design of this machine that the *method* has become its *name—Chain Feed Drill.* It is significant that for this vital drive, *Diamond* Roller Chain is first choice.

Like other leaders in the oil field, George E. Failing Co. depends on Diamond Roller Chain's uniform high quality to deliver dependable, long-life, low-cost performance.

Look for Diamond Roller Chain on new equipment and ask for Diamond by name when replacing roller chain in the field. You get more service from Diamond, so it costs less.

DIAMOND CHAIN COMPANY, Inc.

Where High Quality is Traditional

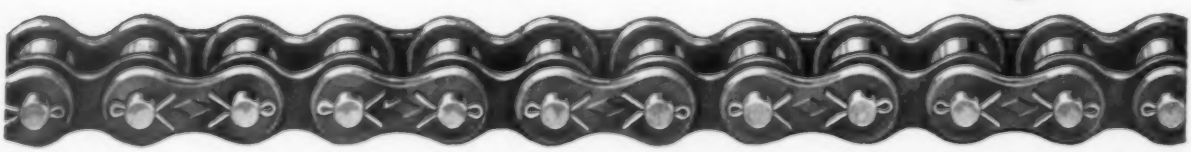
Dept. 475, 402 Kentucky Ave., Indianapolis 7, Indiana

Tulsa Office: 2238 Terwilleger Blvd.

Offices and Distributors in All Principal Cities

Please refer to the classified section of your local telephone directory under the heading CHAINS or CHAINS-ROLLER

DIAMOND ROLLER CHAINS



PRINCIPAL AREAS of discovery during the first half of 1957 are pinpointed on the map. All have contributed new knowledge and opened new doors to discovery, but few have contributed heavily to U. S. reserves.

Reserves lag as . . .

Discoveries March On

By Frank J. Gardner

EACH YEAR about this time, we take a backward look at what oil finders have accomplished during the first half. What have we achieved in the way of geological discovery and in reserve additions?

We've found a lot of fields, but we haven't found much **oil.** As a matter of fact, we may not have found as much as we've produced. One major company has come up with a current average discovery rate for the U. S. of 12 bbl. of oil per foot of hole drilled; another uses 13 bbl. per foot as its guide for day-to-day finding success. Now that's a pretty low finding rate, but A.P.I. figures for the past few years bear out these rules of thumb. If we use a figure halfway between the two, we end up with a "total oil found" figure of 1,347,212,500 bbl. for the first half of 1957. Compare this with the total production figure of 1,354,817,975 bbl. and you'll see why reserve experts are all wearing such long mid-'57 faces.

The main events . . . Geologically, it's been a fairly interesting first half, but not what we'd call unusually exciting. The main events are bannered on the map.

In western Canada, British Columbia has surprised us all by yielding six new oil fields since January, and a seventh is on the way. Previously, the B. C. search was for gas—oil was incidental; but now, the province emerges as a possible major source of new Canadian oil. Eastward, the triple-hit Devonian-Slave Point discoveries at Virginia Hills, Swan Hills, and Kaybob have projected the western Alberta plains firmly into the arena of active future search, and the discovery of 148 ft. of Devonian D-3 reef at Innisfail has been hailed as 1957's most important strike in Canada. The drilling and discovery dance in southeastern Saskatchewan has continued at an ever-faster tempo, and estimators believe a half-billion-barrel province has been opened there.

Are discovery achievements . . . The Rocky Mountain district was highlighted by the discovery of Outlook field in Sheridan County, northeastern Montana; here, Amerada Petroleum Corp. has finished three new pool discoveries (two Silurian and one Red River).

Also in Montana, Texota Oil Co. 1 Goffena opened the 1957 season with a 554-bbl. discovery in Musselshell County from the Amsden-Lower Pennsylvanian; at about the same time, in southwestern North Dakota, Northern Pump Co. 1 Fritz opened a Heath-Mississippian pool in Billings County at Rocky Ridge.

Two other Rocky Mountain achievements centered at Donkey Creek field in Crook County, Wyoming, and at Southwest Eads field in Kiowa County, Colorado. At Donkey Creek, True Oil Co. found flush Pennsylvanian production for the first time in the northeastern Powder River basin. At Southwest Eads, Continental Oil Co. firmly established commercial oil for the first time on the vast Las Animas arch of eastern Colorado.

In Utah's Paradox basin, the hot discovery spree that began in early 1956 reached new crescendos of excitement as operators proved Aneth field to be a 200-million-barrel field, and other discoveries in the basin may well push the proved figure there to half a billion. Here, and offshore Louisiana, are where we've found the oil of 1957.

Elsewhere, to the south and east, the emphasis has been on depth. Deep Ordovician success in western Oklahoma's Anadarko basin has unleashed a score or more of 18,000 to 20,000-ft. wildcat announcements. Shell Oil Co. opened the first field for the Texas Panhandle's Palo Duro basin in Oldham County. New Mexico operators probed northern Lea County for deeply buried Devonian traps, and with marked success. Mississippi scored four new fields in the deep Lower Cretaceous rocks at 10,000 to 12,000 ft. At Minden, in Webster Parish, Louisiana, Pan American Petroleum Corp. made a producer out of the first of North Louisiana's 18 piercement salt-dome structures, all previously believed to be dry. And in Texas, the news spotlight fell on the old Powell field with a Smackover discovery, and on the long-tested Pescadito salt dome in South Texas' Webb County, where Texas' deepest salt core was penetrated at 15,070 ft.

Summing up, it's been a half-year of interesting geological achievement accompanied by a very poor reserve addition. But despite current pessimism in many industry circles, the oil finders are confident that exploration will rebound in the second half.

Ventura Basin—Scene of

New drilling in old fields, drilling programs below regular pay levels, and exploratory drilling beyond field limits make Ventura a new action spot.

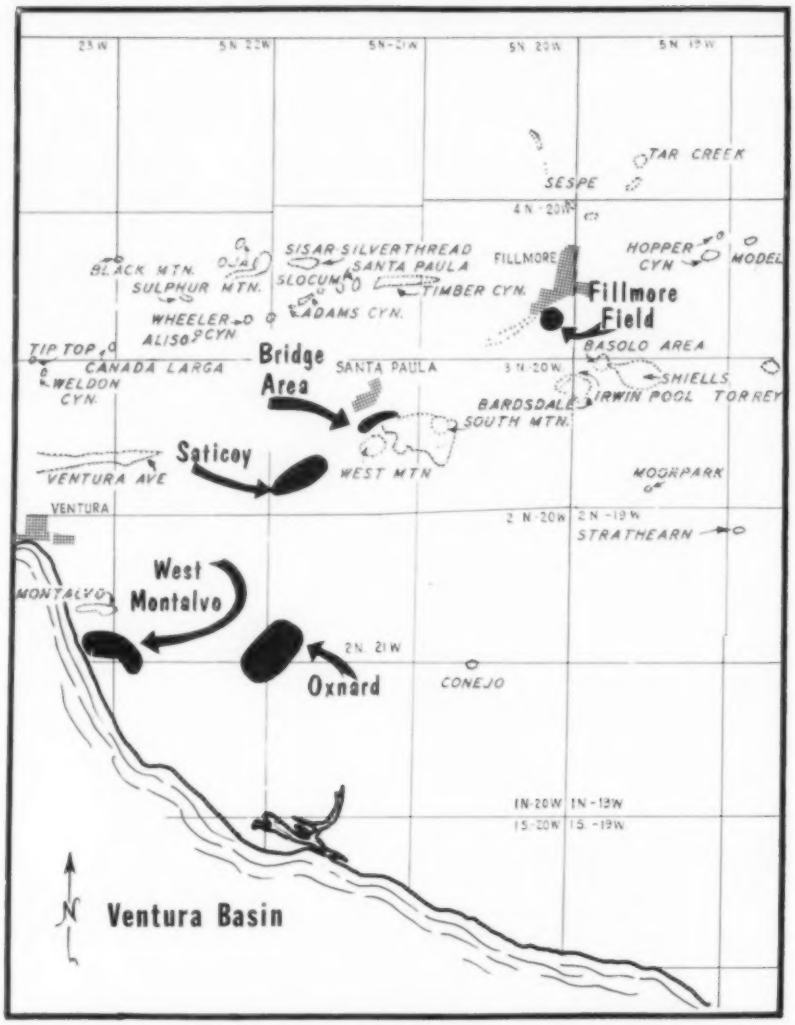
by William T. Smith
District Editor

CALIFORNIA'S Ventura basin, scene of some of the state's earliest oil discoveries, is currently witnessing a drilling revival.

It's a story that's beginning to sound like a broken record—the success of deeper drilling in and around known producing structures. But it's a pleasant sounding record because it is paying off in new production.

The bulk of this activity involves the search for Sespe production in the west part of the basin—Oxnard plains—and the hunt for oil associated with the Oakridge fault in the east part of the basin—Saticoy and Bridge pool.

In addition, the deep Fillmore field in Santa Clara Valley also is experiencing an upswing in drilling.



KNOWN producing areas witness Ventura basin drilling revival. Most of the activity is in the western part of the basin.

Sespe search . . . The two main areas of this play are at West Montalvo field and Oxnard field.

At West Montalvo the lure is McGrath-pool and Colonia-pool production. The McGrath is a small Pliocene-age, Pico-sand, pool. The productive area comprises about 260 acres. The 11 wells in this pool are producing from a stratigraphic trap dipping to the north and pinching out in a southerly direction.

The big search at West Montalvo is for Colonia-pool production. This pool consists of a large number of poorly sorted Sespe sands separated by shales and mud stones. Intermediate water sands also are present. Accumulations result from faulting and lenticularity.

The present productive limits include about 800 acres with portions both onshore and offshore extending out under the Pacific Ocean. Twenty-four wells are producing about 5,500 bbl. daily of 13°-20° A.P.I. crude. Producing depths range from 10,500 to 13,000 ft.

Standard Oil Co. of California has four rigs active in the Colonia-pool play. The most interesting is on a 17,422-ft. extension test of the onshore portion of the pool. This well, located in 35-2n-23w, has been plugged back to 13,500 ft. for completion in a perforated interval at 12,385-12,720 ft.

In another Colonia-pool test, Standard was conditioning mud and hole at 11,734 ft. in 2 Patterson Ranch about ½ mile south of the nearest Colonia-pool well.

A mile east of nearest Colonia producer, Richfield Oil Corp. was drilling and spot coring on 3 Richfield-Doheney-Laubacher. This wildcat in SE SE 31-2n-22w is aiming for the Sespe age Laubacher pool.

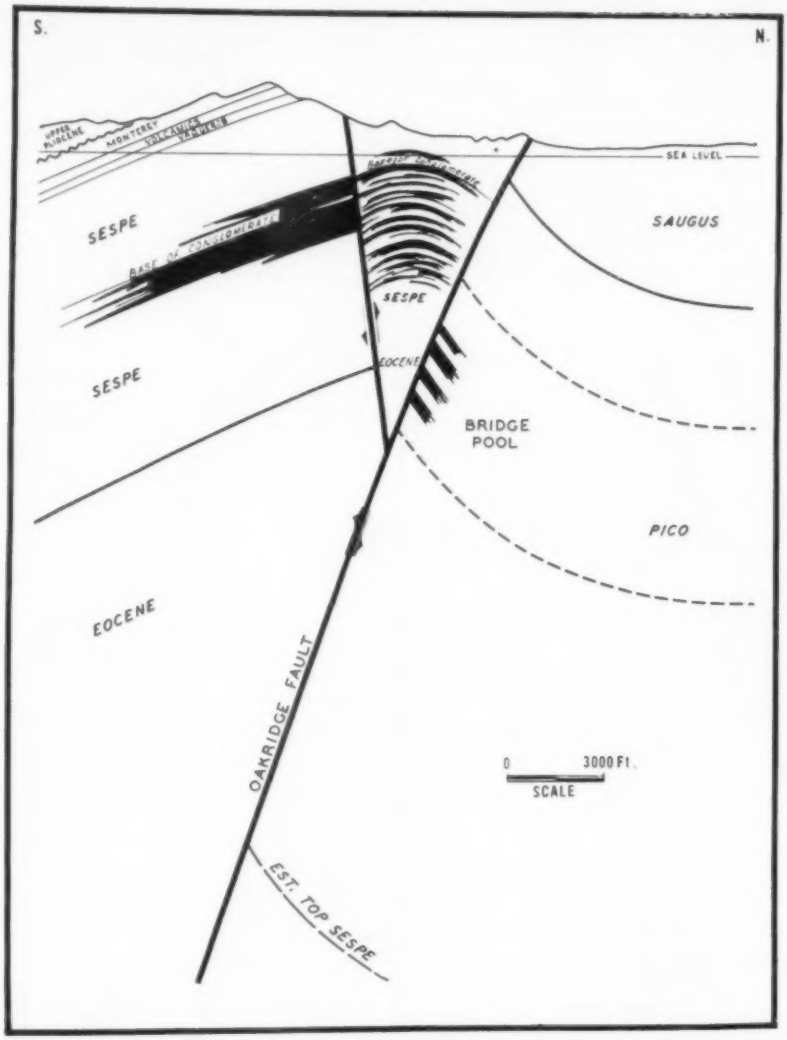
Oxnard field activity . . . The break through here, both literally and figuratively occurred in 1952 when Standard drilled more than 1,600 ft. through the volcanics to find Sespe production. The Sespe discovery area was in the same region where shallow tar zones had been productive since 1936 above the volcanics.

Since the first Sespe discovery, two other producing zones below the volcanics have been tapped. In addition to the original McInnes, Sespe production now includes the Livingston and Lucas pools. The bulk of production from all three zones comes from an area approximately 3 miles long and ½ mile wide.

Livingston production is generally associated with a narrow band along the Vaca fault. McInnes zone oil is from both stratigraphic and fault-trap accumulations.

Two interesting wildcats currently are being drilled in the Oxnard field region. One is an extension test by The Texas Co. about ½ mile west of their new Livingston-zone fault-block discovery of last March. The general area of this discovery is east of regular Oxnard field production.

The other is a wildcat by Reserve Oil & Gas Co. in SW NW 1-1n-22w on the west edge of Oxnard field. This



TYPICAL BRIDGE-AREA pool well is drilled through or under Oakridge fault for Pliocene production. South Mountain field.

New Deep-Drilling Activity

McInnes-zone wildcat has a planned total depth of 6,400 ft. The location is only 660 ft. north of Standard's 5 Pfeiler which was recently completed at 6,288-6,408 ft. for 350 bbl. daily of 24.5° A.P.I. crude.

The other activity in the Oxnard field region is southwest of regular production where both Standard and Texaco each had a rig drilling development wells in the McInnes pool discovered by Standard in Sections 1 and 2 of 1n-22w. This is ½ mile south of Reserve's wildcat.

Oakridge fault activity . . . The bulk of this play is concentrated at Saticoy field and the Bridge-pool area of South Mountain field.

Saticoy field is being developed by Shell Oil Co. as operator for itself, Superior Oil Co., and General Petroleum Corp.

Production is from Pico sand, Pliocene edge, with accumulations resulting from the Oakridge fault up structure with lateral closure caused by additional faulting. There are now 30 wells producing in the field which stretches some 3 miles in an east-west direction and only about 1,000 ft. at its widest point. These wells, 16 of which are completed dually, are producing about 6,000 bbl. daily.

The productive sands are found between 6,500 and 9,500 ft. with several shale and siltstone intervals between 200 and 500 ft. thick separating the producing zones. The beds dip steeply ranging between 60° and 80°. Reserve estimates for the field range between 25 to 50 million barrels.

Shell recently announced plans to keep three to four rigs busy with 125 wells the ultimate goal. Drilling is very tricky because of the complex faulting and deeply dipping beds. All are controlled directionally with as many as eight whipstocks required for a single well.

The combination of dual completions plus stringent directional controls adds an average of about $30,000 to each well cost with the usual per-well bill running 1½ to 2 hundred thousand dollars.

Current activity includes five rigs on wells in the field. One includes Shell 20 S.P.S. in NW SE 21-3n-21w which is the most easterly test in the field. It was fishing at 9,112 ft. This location is about ½ mile east of the nearest Saticoy field producer.

At the other end of the field, also about ½ mile from the nearest field well, Standard was drilling 1 Sudden Investment in SW SE 36-3n-22w. It was drilling ahead below 4,755 ft.

Bridge area . . . Structurally, this area is very similar to Saticoy. Like it's Saticoy neighbor 2 miles to the southwest, Bridge-area production is associated with Pliocene beds butting against the Oakridge fault. However, unlike Saticoy, the Bridge-area sands flatten out at points further removed from the fault making the field broader than Saticoy.

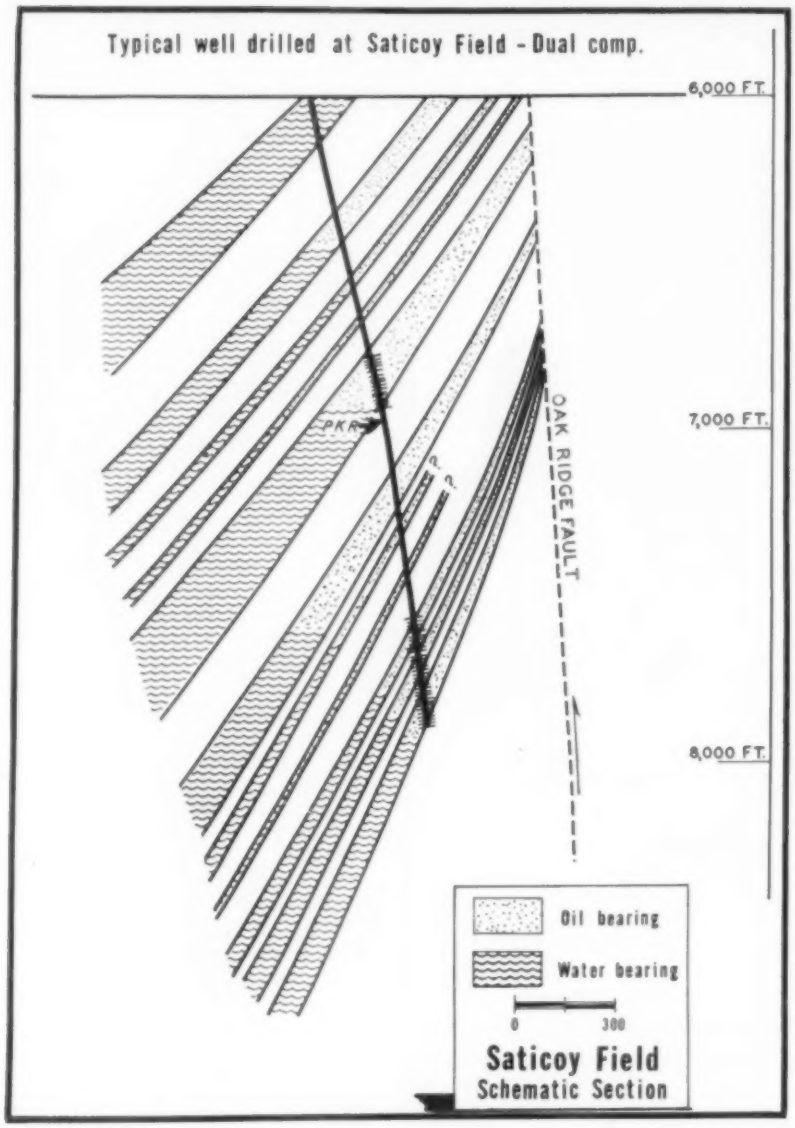
The pool, located on the northwest flank of old South Mountain field, is a band running in a general northeast-east direction. Average completion depth of the 22 wells now in the pool is 8,100 ft. The wells penetrate an average total thickness of 1,200 ft. with a net pay zone of 600 ft. Current production is around 5,500 bbl. daily.

Operators are active in Sections 13, 14, and 15 of 3n-21w with 11 rigs making hole. The most closely watched test is Ferguson and Bosworth 1 Oak Ridge, a 10,029-ft. effort on the east flank of the pool. The operators were cleaning out a bridge plug at 5,100 ft. before perforating for production at 8,400-9,000 ft. and 9,160-9,393 ft.

The Texas Co., as operator for itself and Union Oil Co. on the major holding in the area, is the most active with seven rigs working.

Fillmore field . . . The other big play in the Ventura basin not associated with either the Sespe or Oakridge production is at Fillmore field, west of the town of Fillmore in Santa Clara Valley.

Largely as a result of drilling by Standard and Humble Oil & Refining Co. in recent months, this deep play now extends nearly 3 miles in an east-west direction in Sections 34, 26 and



MOST of the Oakridge fault activity is concentrated at Saticoy field which is being developed by Shell Oil Co., Superior Oil Co., and General Petroleum Corp.

Atlantic 1 Pure Gold in SW NE 25-4n-20w was drilling below 12,851 ft. Richfield 1 Corl & Fleming, Inc., also in SW NE 25-4n-20w was drilling below 5,981 ft. About 900 ft. north of the Atlantic and Richfield wells, Texaco was drilling below 11,465 ft. on 1 Sespe-McNab.

In addition to those three, Standard and Humble had three rigs going on development wells in the field. The other rig was getting ready to spud in an extension test for Richfield in the townlot area of Fillmore in 25-4n-20w.

Offshore . . . Ventura basin offshore work is currently confined to two areas—Summerland and Rincon.

At Summerland, Standard, as operator for itself and Humble, was drilling at 5,330 ft. on Standard-Humble 2 Core Hole on their 5,500-acre offshore lease. Standard is using a gulf type of drilling platform in an evaluation program before building a permanent drilling structure for development of the lease.

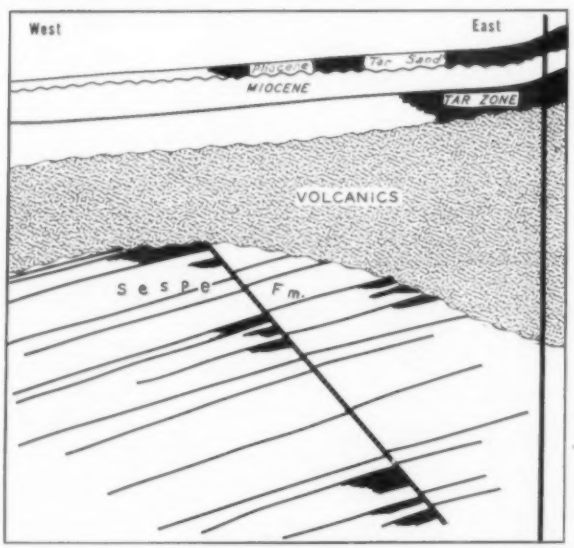
Adjoining the Standard-Humble lease, Tidewater Oil Co. has staked location for its first test of a 500-acre offshore lease which is considered within the productive limits of the old Summerland oil field. No spud-in date has been announced by Tidewater.

At Rincon, Richfield was continuing construction of an earth-filled drilling island from which to develop drill its 1,175-acre offshore lease. Drilling is expected to get under way early next year.

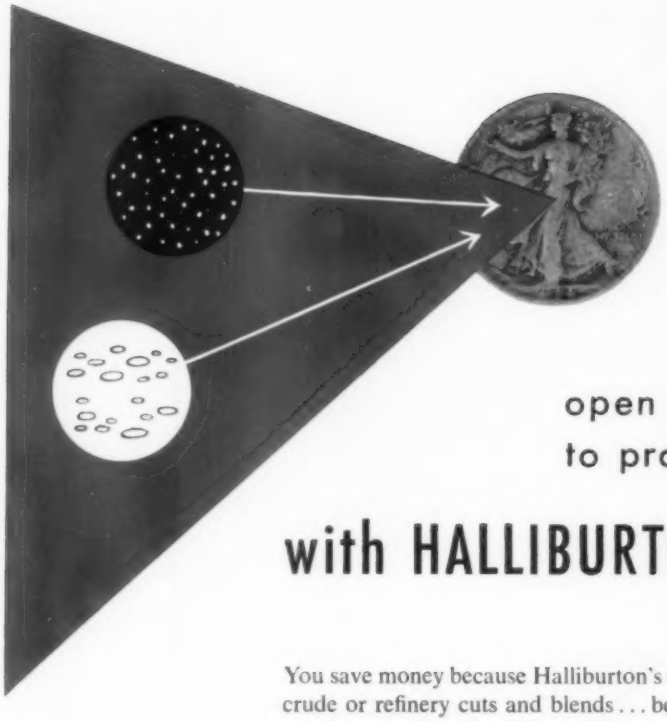
25 of 4n-20w. So far 17 wells have been completed. The bulk of these wells are completed in Pliocene-age Spalding sand found at depths in the 14,000-15,000-ft. range. Earlier this year Humble tapped a second sand, the Perkins, at the extreme east edge of the field. Both Humble and Richfield now have wells in this sand.

Despite depths involved, drilling is routine. The only factor hiking drilling costs is that the field generally underlies rich citrus groves making drill sites expensive. The bulk of present drilling is more than 2 miles east of the original discovery area with seven rigs making hole.

The center of interest now is in 25-4n-20w where Atlantic Oil Co., The Texas Co. and Richfield have significant extension tests under way on the east end of the field.



CROSS-SECTION of Oxnard field. Areas above volcanics have been producing since 1936. Standard drilled three volcanics in 1954 to discover Sespe production below volcanics.



open new channels
to profit

with HALLIBURTON'S SANDOIL

FRACTURING PROCESS

You save money because Halliburton's SANDOIL uses economical, low-cost crude or refinery cuts and blends . . . because Halliburton's pumping and continuous proportioning equipment is sized to the job . . . big or little. You make money from the increased production normally resulting from the economical SANDOIL PROCESS.

SUCCESSFUL IN MANY WAYS

Halliburton's SANDOIL PROCESS has established a high record of success because:

1. *It employs fluids that meet viscosity requirements according to bottom hole temperature, injection rate and pipe size.*
2. *Emulsion problems are controlled by Halliburton's Hyflo and other surfactants that precede, follow or are mixed with the fracturing oil.*
3. *Fracturing oils are selected for compatibility with your formation crude.*

Get more oil . . . and more profit . . . from reluctant reservoirs. Ask your Halliburton representative about SANDOIL. You'll get an unbiased opinion because he has seven different processes from which to choose. Call your local office or write to the Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

HALLIBURTON

OIL WELL CEMENTING COMPANY

PIONEERS IN FRACTURING SERVICES

251 SERVICE CENTERS — JUST MINUTES AWAY FROM ANY RIG

These fields look alike but . . .

Will Northeast Alden Rival Apache?

● This article presents the facts for your comparison. Read these data, then make your own decision.

by Norman S. Morrisey
Drilling-Development Editor

FROM a geologist's point of view, there is a marked resemblance between Northeast Alden field and Apache field in Caddo County, Oklahoma. Only 6 miles apart, the fields appear to be on the same or related lines of folding. But reservoir engineers seriously question if the ultimate recoveries at Northeast Alden will approach the prolific Apache wells.

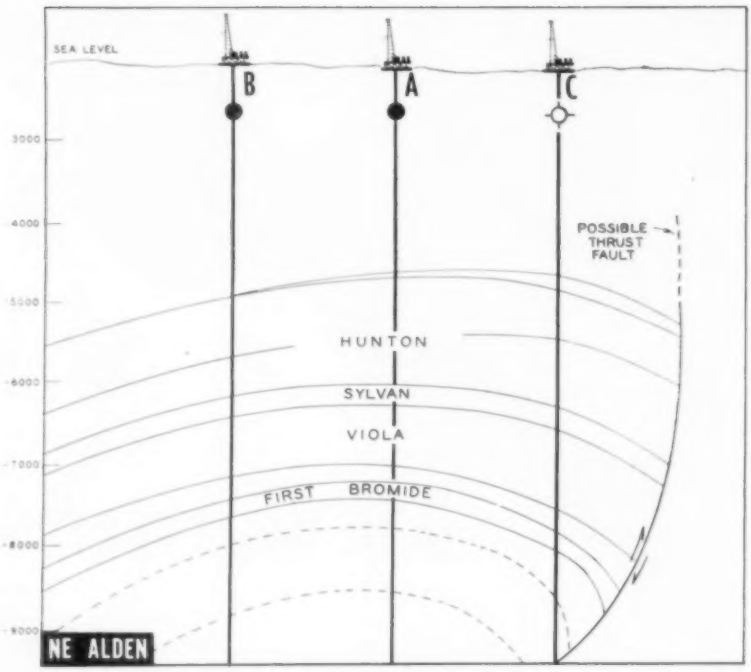
Let's look at the facts . . . Northeast Alden originally was discovered by Sinclair Oil & Gas Co. and Cities Service Oil Co. in August 1956. Well 1 Susie was completed as a flowing well from the First Bromide sand (Well A, Fig. 3). The electric log of Susie shows a shaly Bromide sand section from 8,700-80 ft. with 50 ft. of net sand and the zone tested 50 bbl. of oil per hour.

Since the discovery, Sinclair and Cities Service have completed two additional wells, a west and a north offset to the Susie. The west offset (Well B, Fig. 3) was a "normal well" for the area, although slightly lower than the Susie on the First Bromide sand. But the north offset, the 1 Davison (Well C, Figs. 1 and 3), was a real headache and was temporarily abandoned at 9,191 ft. Correlations within the Hunton limestone showed the Davison to be 30 ft. higher structurally than the Susie (Fig. 5). However, on the base of the Hunton, the Davison was 140 ft. lower than the Susie, and on the base of the Viola, 400 ft. lower. At total depth, the Davison cored dips of 40° in the Bromide. Yet a strike section shows a relatively simple geological picture between the Susie and the Sinclair 1 German (Well D), a dry hole ¾ mile northwest of the discovery.

Apparently the structure at Northeast Alden is an overturned or asymmetrical fold trending northwest-southeast. Probably a thrust fault marks the northeast edge of the structure. There is some evidence to indicate the Davison cut a thrust fault in the Viola, possibly repeating 200 ft. of upper Viola limestone.

Apache and Northeast Alden . . . Compare the structure at Northeast Alden with that at Apache (Figs. 1 and 2). The initial test at Apache, Texaco 1 Smith, a dry hole, logged a normal section to the top of the Viola. The Smith drilled an abnormally long Viola section, 1,170 ft. compared to the southwest offset that had only 950 ft. The Smith then drilled vertical upper Simpson beds, reentered the Viola (probably upside down), and was finally plugged as a dry hole. Thus Apache, too, is an overturned and probably overthrust fold, similar to Northeast Alden.

Marked differences exist between the two fields.



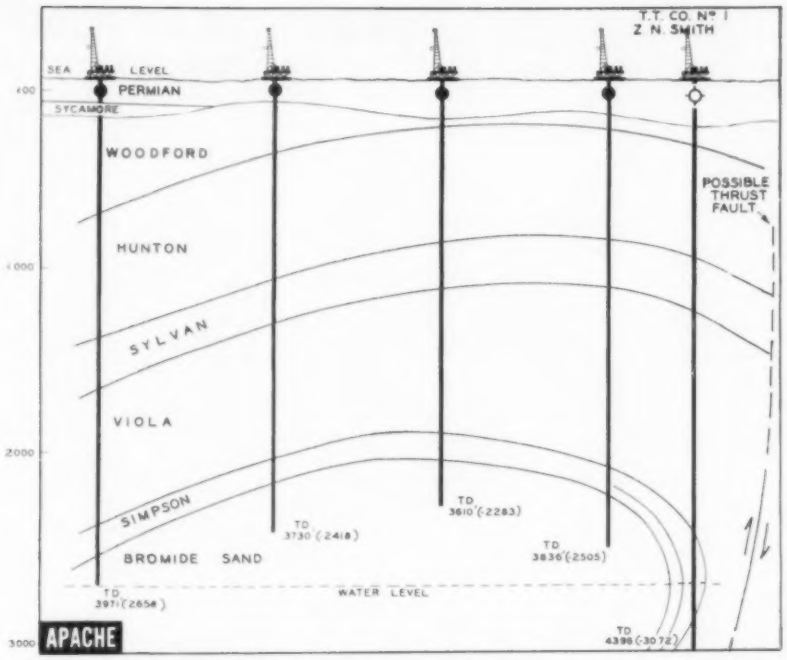
MARKED SIMILARITY is shown between Northeast Alden (above) and Apache (right). Fig. 1.

● Wells at Apache find the First Bromide sand at a drilling depth of only 3,600 ft. (2,200 ft. subsea). At Northeast Alden, the First Bromide is tapped at 8,700 ft. or 7,300 ft. subsea.

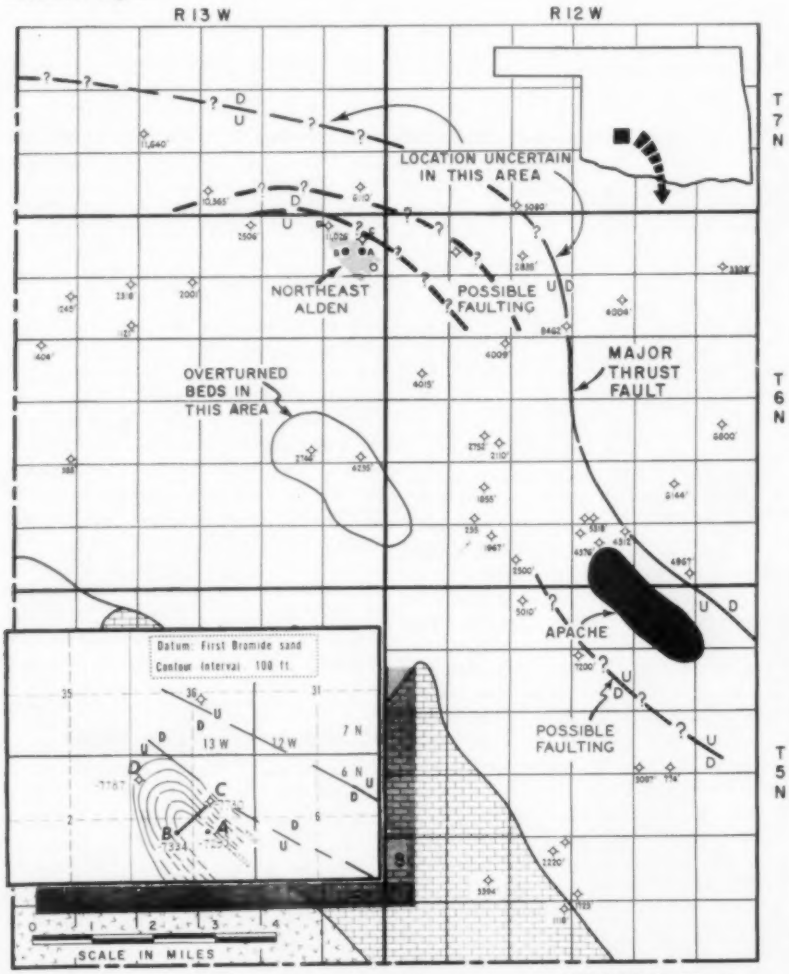
● Apache wells have logged a 700-ft oil column above the oil-water contact with a highly porous and permeable sand. The sand at Northeast Alden is tighter. The oil-water contact has not been defined, but there is limited evidence to show that the oil column may exceed 500 ft. if the Sinclair German tract (SW NW NW Sec. 1) is productive as suggested by electric log and sample analysis of the abandoned test.

● Wells at Northeast Alden cost nearly four times the price of typical Apache field wells.

How big is Northeast Alden? . . . The producing limits at Northeast Alden



BOTH Apache and Northeast Alden structures are probably overturned and thrust-faulted anticlines. Fig. 2.

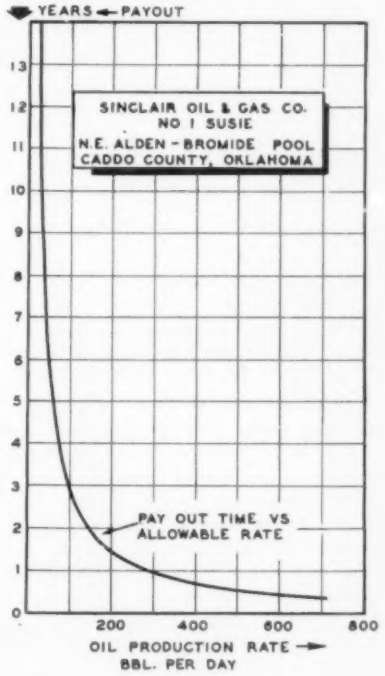


NORTHEAST ALDEN has Bromide sand production at 8,700-9,000 ft. Fig. 3

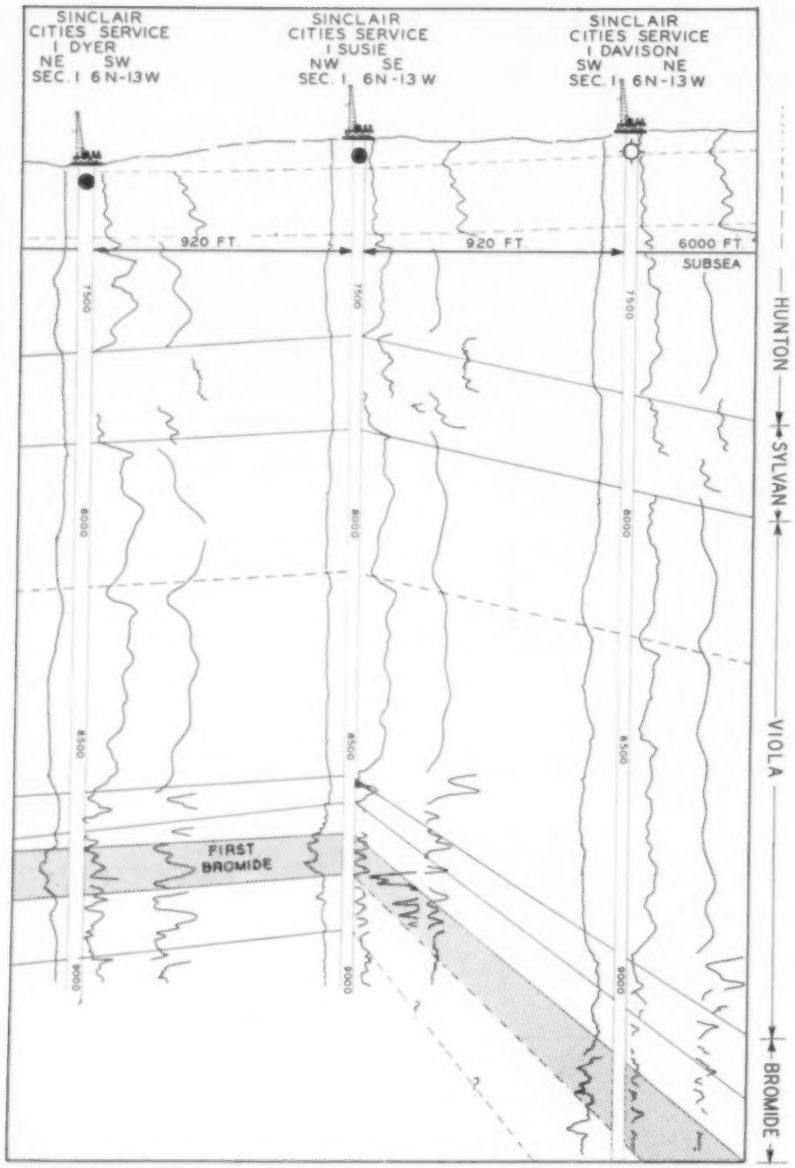
. . . reservoir engineers question if recoveries at Northeast Alden will approach the prolific Apache wells."

have not been established. However, it's a good bet that the field will be a long narrow anticline, trending northwest-southeast; its width could be only ½ to ¾ mile. Well control shows the field probably is plunging to the northwest, but there are no wells close enough to show the southeast plunge or faulting that must be present to form the producing closure. Fields like Northeast Alden can stretch for several miles, even though only a few locations wide. A good example of this is Apache, 3 miles long and only ⅝ mile wide.

Wells come high at Northeast Alden . . . The discovery well cost $311,000 to drill to the McLish and Sinclair estimates that 9,000-ft. First Bromide field wells will run $234,000 to drill and complete. This is considerably more than most 9,000-ft. wells cost in Oklahoma. On the Golden Trend in Gar-



ORIGINAL allowable for the discovery at Northeast Alden was only 47 bbl. per day and the long payout period tended to discourage further drilling. However, the Corporation Commission granted a higher allowable, 119 bbl. of oil per day, because of the unusually high costs and hazards in the area. Fig. 4.



SOUTHWEST-NORTHEAST cross-section shows an overturned fold. Notice the change in dip in the 1 Davison from relatively flat southwest dip in the Hunton section to abnormally steep northeast dip in the Viola and Simpson section. Fig. 5.

vin County, for example, a 9,000-ft. Bromide producer costs $135,000 and a 13,000-ft. producer costs $235,000. Operators are faced with an abnormally long payout period on these deep Caddo County wells. The original allowable for the Susie was 47 bbl. per day, but the Oklahoma Corporation Commission granted an exception to the depth-allowable schedule. Because of the unusual hazards and high costs, Northeast Alden now has a daily allowable of 119 bbl. per well.

The concern of the operators over the payout period is apparent in Fig. 4. On the original allowable of 47 bbl., the operators were faced with a payout of at least 6 years; this is based only on well and actual operating costs without allowing for overhead, lease and exploration costs, or taxes.

Reservoir . . . Unlike Apache, the Northeast Alden pool appears to be a gas-in-solution-drive reservoir. Apache has an active water drive. The average porosity at Northeast Alden is on the order of 10 per cent in the First Bromide and average permeability under 30 millidarcies.

Will Northeast Alden rival Apache as an oil field? Probably not, because it's hard to beat Apache's production to date of 50,000 bbl. per acre at only 3,500 ft. But it's a safe bet Northeast Alden will prove profitable with 50 ft. of oil-stained Bromide sand at 8,700 ft. on 40-acre spacing.

EXPLORATION HIGHLIGHTS

APPALACHIAN

PENNSYLVANIA

Young Township Wildcat Flows Gas

In Young Township, Indiana County, Southwest Pennsylvania, New York State Natural Gas Corp. N-545 J. R. Learn, wildcat, elevation 1,172 ft., gaged 1,000,000 cu. ft. gas after fracture. Onondaga 7,465 ft., chert 7,483 ft., gas, Oriskany sand 7,620-48 ft. Total depth 7,649 ft. Manufacturers Light & Heat Co. 3-4426 ft., R. & P. Coal Co., elevation 1,173 ft., tested 500,000 cu. ft. gas after fracture. Oriskany sand 7,395-7,408 ft., gas 7,400 ft. Total depth 411 ft.

WEST VIRGINIA

Rank Wildcat Begins in Red Sulphur District

In Red Sulphur district, Monroe County, West Virginia, United Fuel Gas Co. has started drilling operations in 8517 A. W. Crotty, rank wildcat, elevation 1,943 ft., Narrows Quadrangle, 1.9 miles south of latitude 37 degrees 30 minutes, and 4.0 miles west of longitude 80 degrees 45 minutes.

- In Morgan district, Monongalia County, Plymouth Oil Co. 1 Myrtle A. Pixler, elevation 1,434 ft., is dry and will be plugged in the deep formation due to tubing failure in attempts to fracture. The Onondaga was at 6,985 ft., chert 6,998 ft., again at 7,235 ft., Oriskany sand 7,200 ft., again at 7,320 ft. Total depth 7,391 ft.
- Tridelphia district, Logan County, R. & H. Gas Co. brought in 1 J. Blackburn, with a large flow of gas gaging 15,700,000 cu. ft., Big Lime, but with a rock pressure of only 350 psi., indicating a considerable decline of approximately 50 per cent in the last year in this field. This well finished at 2,256 ft.

Exploration This Week

Appalachian	172
California	174
Canada	174
Michigan	175
Nebraska	175
Nevada	175
Oklahoma	175
Oregon	176
Texas	176
Washington	176
Wildcats	176

An Aerial View of
"The Oil Industry's Ship Yard"

W. E. Pennington
Executive Vice President

Vic Bourrous
Asst. Manager

Peter Bodner
Vice President—Engineering

Up-to-date facilities and methods at Levingston make it possible for you, "Mr. Oil Operator," to get what you need in marine drilling equipment. The best men in the business direct the operations at Levingston. Modern facilities and new methods insure economy, speed, and quality in the finished product.

Levingston SHIPBUILDING COMPANY

"THE OIL INDUSTRY'S SHIP YARD" • ORANGE, TEXAS

JOURNAL MANUALS

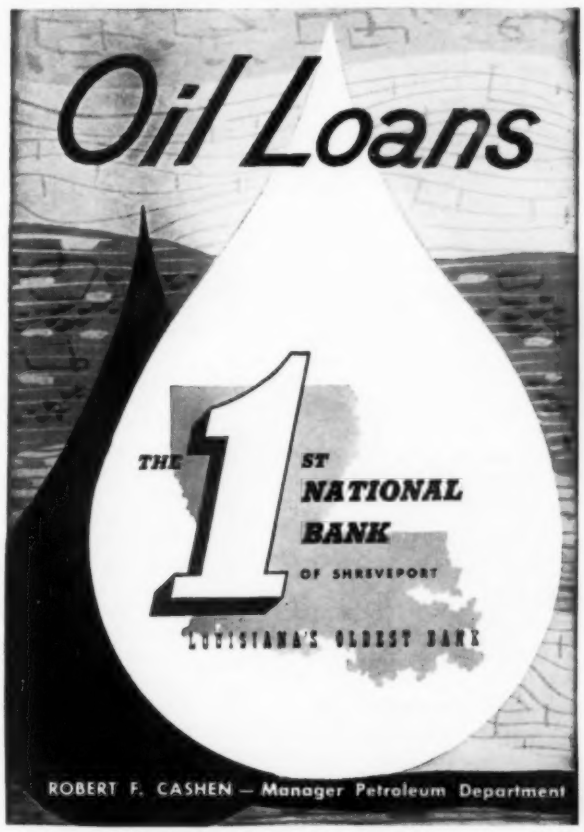
Save money . . .

Take your pick . . . . . $1 each

- Drilling Engineer's Reference Manual
- Engineering Fundamentals in Modern Drilling
- Hydraulic Fracturing
- Secondary Recovery
- Water Flooding-Design and Operation
- Water Flooding-Theory and Practice
- Oil Well Pumping Methods
- Instrumentation
- Pumps, Fans and Blowers
- Process Techniques for H_2S Extraction-Sulfur Manufacture
- Corrosion and Its Control
- Going Places? (The best of the Journal's "Oil and Management" series).

Clip this ad, mark the manuals you want and send it with your check and return address to:

Reader Service Department
The Oil and Gas Journal
Box 1260 Tulsa, Oklahoma



CALIFORNIA

Summerland Offshore Activity

Standard Oil Co. of Califrornia has abandoned its second core-hole on the 5,500-acre offshore lease it holds here jointly with Humble Oil & Refining Co. This second hole was taken to 7,387 ft. Standard, as operator, is conducting the coring program from a drilling platform to evaluate the lease before putting in a permanent development drilling structure.

Adjoining the Standard - Humble lease, which is considered wildcat acreage, Tidewater Oil Co. was drilling ahead below 3,009 ft. on 1 Seaside State, its first test of a 500-acre offshore parcel considered within the structure of the old Summerland field. Unlike Standard, Tidewater is slant-drilling its well from an offshore site.

New Fault Block At Bandini

Nordon Corp., Ltd., chalked up a new fault block discovery with a 5,477-ft. test in Bandini field in metropolitan Los Angeles. Nordon reported hitting the new Meyer sand zone at 5,380 ft. No production figures are available.

Important Extension Completed at Chowchilla

Calitex Land & Development Co. extended production in Chowchilla gas field, Madera County, ½ mile from the nearest other producer on the north edge of the field. Calitex perforated the zone at 7,995-8,010 ft. and completed the well for a rate of 4,000 M.c.f. daily through a 19/64-in. choke.

New Pool Discovery at Athens-Rosecrans Field

The Texas Co. tapped a deeper pool in the old Athens - Rosecrans field in the Los Angeles basin with a 9,662-ft. extension test in the northern edge of the field. The well, 1 Howard Park, found production at 7,658-7,968 ft., 8,041-8,190 ft. and 8,525-9,140 ft. It was put on the pump for 139 bbl. daily of 31.5°-gravity crude, 34 per cent cut.

CANADA

ALBERTA

Drilling Completed at Innisfail Discovery

The 1-16 Innisfail D3 zone oil discovery well drilled by the team of Canadian Oil Companies, Ltd., Security Freehold Petroleums, Ltd., and the Calgary & Edmonton Corp., has completed drilling after encountering the oil-water interface in that horizon during the latest drill-stem test conducted at it. This significant southern Alberta find, 60 miles north of Calgary, contains 148 ft. of net pay zone in the reef (based on long evaluations conducted after the sector had been penetrated) and not the 150 ft. reported last week in this column. The reason for the thinner pay zone is the fact that the original zone top reported was a sample pick only and on the basis of the log the zone came in 4 ft. lower.

This strike lies on LSD 1, 16-35-1w5, 6 miles southwest of Innisfail townsite and 1½ miles northwest of another discovery hole drilled by the same team, 11-11 Innisfail. That find, however, was recorded in the basal Cretaceous when an oil column was encountered during drill-stem test operations. It was also carried down to test for Devonian prospects but found the reef 247 ft. lower than the new discovery and also water loaded.

The 1-16 Innisfail was carried to total depth 8,650 ft. after contacting the discovery horizon at 8,440 ft. and the oil-water interface at 8,588 ft. Crew of the drilling rig employed at the hole is currently running production casing after which extensive evaluation test will be carried out on it to determine the commercial worth of the find.

BRITISH COLUMBIA

B.C. Gets Another Oil Discovery

Pacific Petroleums, Ltd. and associates have scored another oil discovery in the northeastern sector of British Columbia—incidental to the development and exploration of natural gas being carried out on a large scale by the group. The newest find was chalked up in the Nikinassin horizon the Pacific 13A Buick Creek well, when 3,140 ft. of clean, 42°-gravity oil was recovered upon completion of a drill-stem test in the zone.

The well lies approximately 40 miles north-northwest of Fort St. John townsite, 1 mile southeast of the 4 Buick Creek Nikinassin gas success, 55 miles northwest of Boundary Lake Triassic oil field, on Permit No. 101, a tract of 59,867 acres acquired by the team from Canada Southern Petroleums, Ltd. The group, which includes in addition to Pacific, Canadian Atlantic Oil Co., Peace River Natural Gas Co., and Sunray Oil Co., earned its interest in the lands by previous drilling and the Canada Southern Co. retained a 25 per cent interest in them. The Catawba Corp. also holds a gross override royalty in the tract as well as a portion of Canada Southern carried interest.

Two drill-stem tests were conducted in the discovery horizon. The first of which gave up 3,140 ft. of clean oil, along with some gassy oil-cut mud while the second indicated that pay thickness had been penetrated when 1,500 ft. of salt water as well as 1,570 ft. of clean oil was recovered from the drill stem. These evaluations covered a total of 74 ft. of zone and the well is scheduled for completion in the Nikinassin formation.

SASKATCHEWAN

Blairmore Gas Flow At Fusilier Wildcat

Canadian Seaboard Oil Co.'s current three-well exploratory drilling program in the Fusilier area of Saskatchewan has so far reaped rich harvests, as the initial two ventures drilled in it have indicated commercial gas success. The latest of the two finds, Canadian Seaboard-Canso 7-12 Fusilier, on LSD 7, 12-34-28w3, flowed gas from the Blairmore formation during drill-stem test in the horizon, at rate of 3,200,000 cu. ft. daily. It will be remembered that the initial venture drilled, discovered gas in the detrital formation by flowing at a rate of 2,500,000 cu. ft. daily and was also the well that recovered a small amount of oil from the Devonian structure during a later test. That oil show has since proved non-commercial, however, and the well has been completed as a gas producer.

This three-well program is being carried out on acreage acquired from Canso Oil Producers, Ltd., and the newest of the two finds lies 7 miles east of the Alberta-Saskatchewan border, 5 miles northwest of Fusilier townsite and 9 miles northwest of the 7-1 Fusilier detrital zone gas well.

Williamson Bags Success At Second Wildcat Try

An American drilling contracting firm, Williamson Drilling Co., a recent entrant into the search for petroleum production in western Canada, has scored success at its second exploratory venture in southeastern Saskatchewan. The recent oil find was at Williamson's 1-8 Lampman, on LSD 1, 8-5-6w2, in the Lampman area of the province, 1¾ miles northwest of the main development sector in Steelman oil field. Drill-stem test in the Charles member of the Mississippian formation indicated discovery when a pipe recovery of heavily oil-cut mud, 160 ft. of clean oil and 20 ft. of water was made follow-

ing the evaluation of 30 ft. of the structure.

This strike, like the previous one for the firm, 16-21 Frobisher, is part of a five-well drilling program on acreage acquired under farmout agreement from Imperial Oil, Ltd. A third well, 13-23 Northgate, has also been completed in the program but was abandoned after failing to indicate commercial success.

MICHIGAN

Best Salina Well to Date Seen at Dorr

Louis Zellman cored from 2,740 to 2,768 ft. in Salina pay objective at his 1 Pyle & Swiderski et al, SE NE SE 25-4n-13w, Salem Township, Allegan County, the extreme south-southwest well drilled to date in Dorr pool. Well, from core analysis, showed 15 ft. of effective pay in this 28-ft. section. Pay appeared to be good enough to promise completion at this well as the best Salina producer drilled to date in the pool.

Meanwhile, same operator's 2 Helmer, SE SW NE 25-4n-13w, was being flow tested following a sand frac treatment in Salina oil-gas pays. Well was flowing at the rate of approximately 135 bbl. of net fluid a day, about 40 per cent oil. An undetermined, but large, amount of gas was likewise showing. The water, according to last reports, is decreasing. Well was bottomed out in Salina A-2 dolomite at 2,792 ft. Section between 2,747-68½ ft. was perforated, acidized and fractured. Water is believed to be showing from 2,767-68½ ft.

The "missing link" Traverse oil producer between the original Edmore oil pool and the current extension area was completed good for 220 bbl. of oil and an estimated 1,000,000 cu. ft. of gas a day after acid treatment with 1,000 gal. at Daily Crude Oil Co. 8 Christensen, NE NE NE 10-12n-15w, Home Township, Montcalm County.

NEBRASKA

WESTERN NEBRASKA

Banner County Discovery Completed

Sunray Mid-Continent Oil Co. and Zephyr Drilling Co. have completed a wildcat producer at the 1 Peterson in Banner County, in the Denver basin.

The well, located in the C SE SE 12-18n-57w, was completed in the "J" sand and pumped at the rate of 198 bbl. of oil a day following perforations at 6,471 to 6,475 ft. Total depth of hole was 6,550 ft.

NEVADA

White River Valley Wildcat Takes Cores

Standard Oil Co. of California was preparing to drill ahead below 2,336 ft. on 1 County Line Unit, its wildcat in the White River Valley, White Pine County. Standard took a core at 1,665-75 ft. which recovered volcanic tuff, light to medium green, mottled pink and red, common Biotite Sanidine and quartz grains. Another core at 2,327-30 ft. recovered conglomerate, cobbles of limestone and red matrix. No reports were available on a third core pulled at 2,330-36 ft.

OKLAHOMA

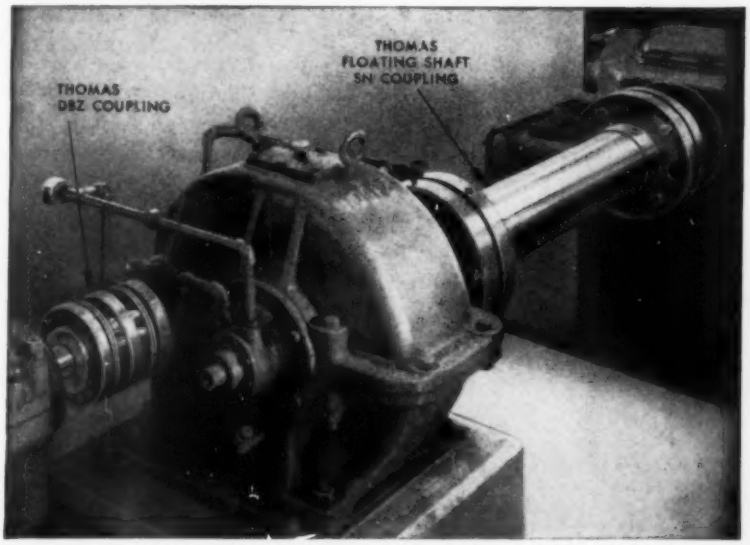
PANHANDLE

New Gas Field Opened In Beaver County

Carter Oil Co. opened a new gas pool in Beaver County at its 1-A Fickel Unit in C SW NE 16-3n-25eCM. The well flowed 13,500 M.c.f. of gas per day from Tonkawa-Pennsylvanian at 5,518-53 ft.

THOMAS FLEXIBLE COUPLINGS

Give You Freedom From Coupling Maintenance



NO LUBRICATION NO MAINTENANCE NO WEARING PARTS

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings. These all-metal couplings are open for inspection while running.

They will protect your equipment and extend the life of your machines.

Properly installed and operated within rated conditions, Thomas Couplings should last a lifetime.

Under Load and Misalignment only Thomas Flexible Couplings offer all these advantages:

1 Freedom from Backlash Torsional Rigidity
2 Free End Float
3 Smooth Continuous Drive with Constant Rotational Velocity
4 Visual Inspection While in Operation
5 Original Balance for Life
6 No Lubrication
7 No Wearing Parts
8 No Maintenance

Write for Engineering Catalog 51A

THOMAS FLEXIBLE COUPLING COMPANY
WARREN, PENNSYLVANIA, U.S.A.

Marmaton Lime Is New Pay In Northeast Greenough

Northeast Greenough field in Beaver County has a new pay—the Marmaton lime of Pennsylvanian age.

The discovery well is Ambassador Oil Co. 1 Oklahoma in SW NE SW 14-6n-22eCM. The well flowed 4,640 M.c.f. of gas per day on drill-stem test at 5,494-5,502 ft.

New Oil Pool Opened 7 Miles from Production

A rank oil discovery in Beaver County was reported by Kingwood Oil Co. The 1 Byerley in C NE SW 24-2n-25eCM, 7 miles from oil production, recovered 90 ft. of clean oil and 45 ft. of mud-cut oil on drill-stem test at 7,201-17 ft. A test at 7,735-57 ft. got 60 ft. of slightly gas-cut mud.

NORTHWEST

Chester Gas Pool Opened At Harper County Wildcat

Another Mississippian gas discovery was added to Harper County production last week at Shell Oil Co.'s 1 State in C NW SE 36-28n-25w.

The Chester lime discovery flowed 3,200 M.c.f. of gas per day on a drill-stem test at 6,510-42 ft. Recovery was 30 ft. of heavily gas-cut mud.

SOUTHWEST

Carter Gets 90 Feet of Ordovician Pay in Kiowa

An important Ordovician discovery is seen for Kiowa County in southwestern Oklahoma's Wichita Mountain area. Carter Oil Co. 1 McDonald in NW SE SE 16-7n-14w, found the Simpson sand at 3,316 ft. The Simpson has 90 ft. of pay zone indicated.

A drill-stem test at 3,319-55 ft. got 3,500 M.c.f. of gas per day. Another at 3,355-3,403 ft. got 5,700 M.c.f. of gas per day and some condensate.

This wildcat lies northwest of the Southwest Carnegie field area between two fault trends. Nearest comparable production is at Northeast Alden (Susie) field in Caddo County to the southeast. The fault trends in this area lie on the north flank of the Wichita Mountain uplift.

OREGON

Douglas County Wildcat Drilling Ahead

General Petroleum Corp. was drilling ahead below 1,014 ft. on 1 Long-Bell, a wildcat in the Sulphur Springs-Siuslaw area of Douglas County.

TEXAS

NORTH TEXAS

Heavy Oil Flow Reported At Montague Wildcat

Cheyenne Oil Corp., Wichita Falls, has completed its 1 L. N. Husband as a Bend conglomerate strike in northeastern Montague County.

On final test through ½-in. choke, the well flowed 283 bbl. of oil in 5 hours, for a daily calculated rate of 1,344 bbl. Perforations were at 6,468-87 ft. Location is in Section 18, C. Borger Survey, 4 miles northwest of St. Jo, 1 mile northwest of St. Jo field, and northeast of Engle field.

Location has been made for a 7,300-ft. wildcat 3 miles south of St. Jo townsite by The Texas Co. The well will be 1 H. L. Bowen, on a 138-acre lease in Samuel Cable Survey, A-1449. The drill site is 3½ miles east of 7,000-ft. production.

Young County strike . . . Stephens Oil & Gas Corp. 1 Boozer, in Section 1104, TE&L Survey, 1 mile northeast of South Bend, blew out following a drill-stem test in Bend conglomerate at 4,003-10 ft. The well blew out while pulling pipe. There was no estimate on the oil flow, but operators estimated they saved 2,500 bbl. of oil by constructing pits. No. 1 Boozer is 1 mile southwest of 2,700-ft. production, and was drilling on 4,600-ft. contract.

TEXAS PANHANDLE

Gas and Oil Found At Ochiltree Wildcat

Phillips Petroleum Co. has discovered both oil and gas in a multiple-pay wildcat well near the center of a 23,000-net acre block in Ochiltree County, 50 miles northeast of Borger.

The 1 Pshigoda flowed at a daily rate of 798 bbl. of 42.7°-gravity oil through 2-in. tubing from perforations at 5,711-31 ft. in a 25-ft. Douglas sand section. The well also tested at a rate of 6.1 million cubic feet of gas daily in the Morrow sand from perforations in a 17-ft. pay section beginning at 8,973 ft. Shows of oil and gas in a 25-ft. section of the Cleveland sand topped at 7,020 ft. indicated a third possible productive zone.

The 1 Pshigoda is in Section 572, Block 43, H&TC Survey, on a half-interest 2,665-acre unit.

WASHINGTON

King County Report

McCulloch Oil & Exploration Co. of California was drilling below 4,010 ft. on 2 Pasquier in the Enumclaw area of King County.

Successful Wildcats

ALBERTA

Cities Service 8-6 Alsike, LSD 8, 6-49-4w5. TD 6,050 ft. Cardium sand oil well.

Richfield 10-10 Schultz Lake, LSD 10, 10-41-12w4. TD 3,375 ft. Basal Quartz oil well.

Tennessee Gas Transmission Crown A-30-1, Padstow, LSD 5, 30-56-8w5. TD 5,320 ft. Nordegg gas well.

BRITISH COLUMBIA

Gulf States 3 Gundy Creek, 56 degrees 48 minutes, 01.4 seconds North Latitude 122 degrees 06 minutes 32 seconds west Longitude. TD 8,137 ft. Triassic gas well.

CALIFORNIA

Kern County: Intex Oil Co. 1-21 Bowles, SW NW 21-26s-28e, 19 BOPD, 16.8° gravity, 22 per cent cut, perfs. 1,476-1,511 ft. TD 1,511 ft. (New fault block discovery in Dominion area of Mount Poso field).

COLORADO

La Plata County: Murchison Trusts 1-13, Blk. 16, NE 13-32n-9w. IP 3,400 M.c.f. of gas per day, Mesaverde discovery, new field. TD 6,550 ft. Mancos.

NORTH LOUISIANA

Bossier Parish: Gulf Oil Corp. 1 Haynesville Mercantile Co., SEc 8-18n-1w. IPF 72 BOPD, 4 BWPD, 41.9°, Pettet 5,651-56 ft. TD 6,163 ft. Opens Vanceville pool.

Caddo Parish: Bassett & Akin 1 Alton Keoun et al, SWc NE NW 9-22n-14w. IP 5,280 M.c.f. of gas per day, 76 BDPD, 53°, Paluxy 2,833-37 ft. TD 2,975 ft. Opens Simpson Lake pool.

Webster Parish: Pan American Petroleum Corp. 1 Anna A. Hudson, C E½ NW NW 21-19n-8w. IP 9,000 M.c.f. of gas per day, Paluxy 7,460-66 ft. TD 11,603 ft. Opens Minden pool.

SOUTH LOUISIANA

Plaquemines Parish: Humble Oil & Refining Co. 1-A Humble-Gulf-State Lease 2869, Block 24, West Delta area, Gulf of Mexico. Potential gas well, untested and standing pending further development and market outlet. TD 15,450 ft. (New offshore field.)

St. Charles Parish: California Co. 1 Timkens, 35-14s-22e (5½ miles northeast of Bayou Couba field). IP 414 M.c.f. daily, dry gas, 7/64-in., TP 2,300 psi., perforations 5,836-44 ft. TD 12,500 ft. (New field.)

NEBRASKA

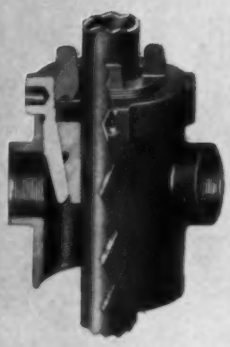
Kimball County: Lewis Brothers et al 1 Bourlier, C NW NW 20-13n-57w. IPP 398 BOPD, "J" sand discovery, new field. TD 7,225 ft. "J" sand.

OKLAHOMA

Beaver County: Carter Oil Co. et al 1 Andrew Hageman Unit, SE SE NW 33-4n-25eCM. IPF 144 BOPD, 15,700 M.c.f.

FIG. 91

Simplicity and compactness, for ease of installation and neatness of hook-up, are incorporated into the Larkin Casing Head (2000 psi test, 1000 psi working pressure.) It is designed to provide a safe and economical means of suspending and packing off casing strings. This head has been tested to support 225,000 lbs., equivalent to 5600' of 7", 20-lb. casing with a safety factor of 2.



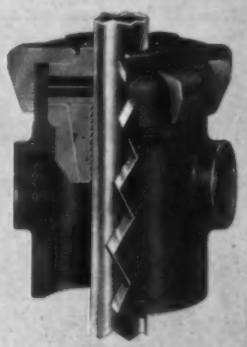
TYPE L

A new member of the Larkin Well Head line, the Type L Tubing Head fills a need in low pressure areas where economy may be effected with complete safety. It is forged steel construction, full opening, 2000 lb. psi, top of body threaded 7" API to accommodate control equipment, hinged three-segment slips, 2" or 3" side outlets.

HEAD OF THEIR CLASS
for medium pressure wells

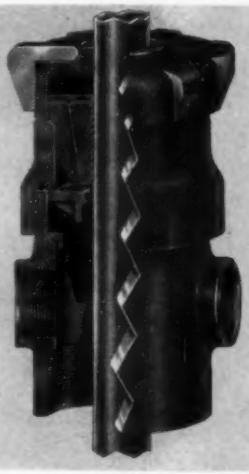
TYPE R

The Larkin Type R. Tubing Head is a conversion from the Type SR Head. This ease of conversion makes it possible to use the same stripper adapter and Neoprene stripper when working on any well equipped with a Larkin Tubing Head.



TYPE SR

The Larkin Type SR Tubing Head is a slip suspension head, equipped with a Neoprene Stripper which serves as a blow-out preventer and oil saver while tubing is being pulled or run. It is very suitable where higher pressures might be encountered.



For detailed information on these and other Larkin Tubing and Casing Heads, please refer to your Larkin Catalog or talk to your Larkin Representative. All Larkin Equipment is available through your supply store.

LARKIN PACKER COMPANY, INC.
WAXAHACHIE, TEXAS

LARKIN
...Through Your Supply Store

PESA

LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPENDABLE PERFORMANCE

of gas per day, Tonkawa sand 5,190-5,200 ft.; Morrow 6,992-7,010 ft. and 7,014-22 ft. TD 7,302 ft. New pay (Tonkawa) for Northwest Ridgeway field.

Cleveland County: Anson Petroleum Co. 2 Hoover, NE SE 21-10n-3w. IPF 825 BOPD, Red Fork sand 7,676-82 ft. Bartlesville sand 7,742-62 ft. TD 8,021 ft. New pay at West Moore (Red Fork).

Lincoln County: Lincoln Drilling Co. 1 Whitney, NE SW NW 11-13n-3e. IPF 42 BOPD, 49.3°, Prue sand 4,193-4,200 ft. TD 4,200 ft. New oil discovery.

McClain County: Gene Goff 1 Sasser, SE SE 8-7n-2w. IPF 178 BOPD, 41°, Bromide 8,291-98 ft. TD 9,188 ft.

Pawnee County: Ray Spess 1-B Brodell, NW 20-20n-9e. IPF 1,200 BOPD, 39°, Peru 1,717-17½ ft. TD 1,717½ ft. New pay in Keystone New pool.

Osage County: Benson-Montin 1-A Osage, NE 33-24n-9e. IPF&P 180 BOPD, 40°, Arbuckle 2,516-19 ft. TD 2,519 ft. New pay in Bandwheel pool.

Stephens County: Eason Oil Co. 1 Pinson, C SW SW NW 30-1n-7w. IP 5,000 M.c.f. of gas per day, Deese sand 7,367-90 ft. TD 9,512 ft. Gas discovery.

NORTHWEST NEW MEXICO

Rio Arriba County: Continental Oil Co. 1 Federal-McBee, NW SE NW 7-33n-6w. IPP 6 BOPD, Gallup sand discovery, new field. TD 6,665 ft. Morrison.

Rio Arriba County: Skelly Oil Co. 2 Jicarilla "B," SW NE SE 31-25n-5w. IPP 100 BOPD, Hospah discovery, new field. TD 7,525 ft. Morrison.

San Juan County: El Paso Natural Gas Co. 1 Sapp, SW NE SE 30-24n-8w. IPP 16 BOPD, Gallup discovery, new field. TD 5,469 ft. Gallup.

SOUTHEAST NEW MEXICO

Lea County: Amerada Petroleum Corp. 1 State "EC," 16-11s-38e, 11 miles NE Gladiola. IP 608 BOPD, ¾-in., 48°-gravity, GOR 297, TP 1,700 psi., shut-in pressure 4,530 psi., Devonian perfs. 12,021-96 ft. TD 12,120 ft., elev. 3,914 ft.

Magnolia Petroleum Co. 5 State, 34-17s-35e. IP 88 BOPD, 10/64-in., 36°-gravity, perfs. 3,068-76 ft. TD 3,195 ft.

Tidewater Oil Co. 6 A. B. Coates-Federal "C," 24-25s-37e. IP 1,006 BOPD, ½-in., 42°-gravity, TP 515 psi., GOR 1202, Ellenburger perfs. 8,115-45 ft., and open hole 8,165-77 ft., total depth.

PENNSYLVANIA

Indiana County, Young Township: New York State Nat. Gas Corp. N-545 J. R. Learn, elevation 1,172 ft., 1,000,000 cu. ft. gas after fracture, Onondaga 7,465 ft., chert 7,483 ft., gas, Oriskany sand 7,620-48 ft. TD 7,649 ft.

Manufacturers Light & Heat Co. 3-4426 R. & P. Coal Co., elevation 1,173 ft., 500,000 cu. ft. gas after fracture, Oriskany sand 7,395-7,408 ft., gas 7,400 ft. TD 7,411 ft.

SASKATCHEWAN

Canadian Seaboard Canso Oil 7-1 Fusilier, LSD 7, 1-33-27w3. TD 3,121 ft. Detrital gas well.

Canpet-Okalta 16-33 South Ingoldsby, LSD 16, 33-3-31w1. TD 3,800 ft. Mission Canyon oil well.

Mobil-Woodley-Sinclair X-2-13 SE Midway, LSD 2, 13-14-19w3. TD 3,772 ft. (Middle Vanguard) Jurassic.

EAST TEXAS

Cherokee County: LeCuno Oil Corp. 1 B. C. Moore, Mary Able Sur., A-59, 2½ miles S Reklaw, approximately 1 mile NE Sessions-Woodbine field. IP estimated 5,000 M.c.f. gas, plus some condensate, ½-in. choke, TP 800 psi., Bacon lime 7,802-09 ft., TD 8,018 ft., elev. 291 ft. Shut-in pressure 3,125 psi.

NORTH TEXAS

Cooke County: Sinclair Oil & Gas Co. 4 Putman, Blk. 79, T. W. Ward Sur. A-1098, 11 miles NE Gainesville, Oil Creek discovery in Walnut Bend field. IPP 65 BOPD, 30°-gravity, GOR 183, Oil Creek sand 5,223-27 ft., IP 58 BOPD, 24/64-in. choke, 31°-gravity, GOR 111, TP 100 psi., Walnut bend 5,009-15 ft. TD 5,274 ft.

SOUTH TEXAS

Bee County: Humble Oil & Refining Co. 3-B Thompson, William Burke Sur., A-9

IN GALVANIZED STEEL BUILDINGS

Plasticool is a sunlight reflective coating that reflects away virtually all infra-red and visible light rays. Lowers inside temperature to within 1 degree of shade. Effective on all kinds of buildings. Can be applied to practically all types of surfaces.

COATING LABORATORIES INC.
319 SO. QUINCY • TULSA, OKLAHOMA

Experience
R. ELMO THOMPSON
R. OTIS McCLINTOCK
RUSSELL HUNT
W. W. MICHAELS
BILL KENDALL
R. H. GWINNER
Here are some of the reasons why oil men call us "Bankers" and bankers call us "Oil Men": years of practical experience in all types of oil loans; service that includes Trust Dept. counsel. Remember, it pays to
Think 1st
FIRST NATIONAL BANK & TRUST CO. of Tulsa
SINCE 1895
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

"an outstanding contribution to the art of oil property valuation" —

OIL PROPERTY VALUATION

by PAUL PAINE, consulting engineer with many years' experience in the oil production business

— because it covers such subjects as:

- the scope of valuation
- properties
- unproved lands
- oil and gas reserves
- elements in a valuation
- valuation methods
- the examination and report

204 pages
$5.50

For sale by

READER SERVICE DEPARTMENT
THE OIL AND GAS JOURNAL
BOX 1260 • TULSA, OKLA.

(8.7 miles northeast of Skidmore). IP 1,900 M.c.f. daily, open-flow potential, dry gas, perforations 4,440-50 ft., and (dual completion) 5,700 M.c.f. daily, open-flow potential, dry gas, perforations 3,874-80 ft. TD 5,200 ft. (New pays in Heard field.)

Brooks County: Humble Oil & Refining Co. 5 Robert J. Kleberg Trust-Quiteria Pasture, Blk. 2, Las Alameda Grant (7 miles east of Rachal). IP 204.65 BOPD, ⅛-in., 37.1°, TP 1,430 psi., GOR 816 cu. ft. per barrel, perfs. 8,370-92 ft. (Frio). TD 9,477 ft. (New pay in Viboras field.)

Cameron County: Sun Oil Co. 1 Cameron County Water District, Share 5, Carricitos Grant (1 mile southwest of Los Indios.) IP 8,600 M.c.f. daily, open-flow potential, GIR 174.66 M.c.f. per barrel, 46.2°, SITP 4,815 psi., perfs. 9,765-82 ft. TD 12,186 ft. (New field.)

Gonzales County: Maple C. Hughes 1 Fielder & Burke, John Pratt Sur. (3 miles south of Leesville). IPP 10 BOPD (net) plus 75 per cent water, 22°, perforations 2,872-76 ft. (Poth sand). TD 2,915 ft. (New field.)

Starr County: Wood Brothers & Langham 1-B D. G. Wood, Sr., Tract 19, Porcion 84 (4½ miles northeast of Rio Grande City). IPP 30.36 BOPD (net), 50 per cent water, 23°, perfs. 1,502-07 ft. (Frio). TD 2,204 ft.

WEST TEXAS

Andrews County: Ralph Pembrook 1 Buffalo-University, 3-1-University Lands, 5 miles S Andrews, 1½ miles SE Bakke field. IP 301½ BOPD, 24/64-in., 42°-gravity, GOR 684, TP 190 psi., Pennsylvanian perfs. 8,996-9,003 ft., ground elev. 3,138 ft. TD 10,250 ft.

Andrews County: Skelly Oil Co. 1 Texas "S," 8-3-University Lands, 8 miles NE Andrews. IP 221 BOPD, 32/64-in., 36°-gravity, GOR 886, TP 25 psi., Spraberry 9,228-84 ft., TD 14,130 ft., in the Ellenburger, PB 10,610 ft. Elev. 3,122 ft.

Crane County: L. H. Armer 6 Ewell McKnight, 10-B17-PSL, 11 miles SE Monahans, new pay discovery in Tubb-Armer field. IP 240 BOPD, 13/64-in., TP 250 psi., 37°-gravity, GOR 980, Glorieta 4,232-42 ft. TD 6,190 ft., elev. 2,730 ft.

The TXL Oil Corp. 1 "AT" Crane Fee, 17-43-T4S-T&P, 17 miles SW Odessa. IP 164 BOPD, 28/64-in., 49°-gravity, GOR 59, TP 125 psi., Ellenburger, open hole, 11,895-11,945 ft. TD 11,945 ft., ground elev. 2,761 ft., top Ellenburger 11,850 ft.

Gaines County: Grover, MacCurdy & Knox 1 Williams, 78-G-WTRR, 9 miles NE Seminole. IP 110 BOPD, ¾-in., 36°-gravity, GOR 320, TP 30 psi., San Andres 5,598-5,623 ft. TD 5,671 ft., gorund elev. 3,268 ft.

Midland County: Magnolia Petroleum Co. 1 Scharbauer Trust, 21-40-T3S-T&P, 14 miles SW Midland, ½ mile SE Parks-Pennsylvanian field. IPP 78 BOPD, 37°-gravity, GOR 651, Spraberry 7,770-8,030 ft. TD 8,030 ft., elev. 2,877 ft.

Runnels County: Frank W. Burger 1 E. A. Voelker, B. W. Taylor Sur. 2, 6 miles S Winters. IP 708 BOPD, 30/64-in., 43°-gravity, GOR 420, TP 190 psi., Gardner sand 4,108 ft. TD 4,116 ft.

Humble Oil & Refining Co. and G. W. Strake 1 Rufus Allen, Sec. 43, HT&B Sur., 4½ miles NW Hatchell. IPP 27 BOPD, 44°-gravity, GOR 600, Palo Pinto 3,727-33 ft. TD 4,550 ft.

Humble and Strake 1-B Allen, George Long Sur. 44, 4½ miles NW Hatchell. IP 213 BOPD, 24/64-in., 47°-gravity, GOR 860, TP 100 psi., Gardner limestone 4,376-83 ft. TD 4,552 ft.

Winkler County: Superior Oil Co. 1-A J. C. Walton, 21-B3-PSL, 3 miles NE Kermit, S extension to Ellenburger production. Dual completion. IP 243 BOPD, 19/64-in., 43°-gravity, GOR 1050, TP 900 psi., Ellenburger 10,632-36, 10,640-50 ft.; IP calculated open flow, 7,500 M.c.f. gas, plus 252 bbl. 66.7°-gravity distillate, GLR 29,800:1, Devonian 8,322-30 ft. TD 10,690 ft., ground elev. 2,906 ft.

WEST CENRAL TEXAS

Stephens County: Fletcher Oil & Gas Drilling Corp. 1 Ramsey-Cartwright, 14-7-T&P, ½ mile W Wayland. IP 2,060 M.c.f. gas, ½-in., CP 400 psi., shut-in pressure 847 psi., Strawn perfs. 2,217-19 ft. TD 2,440 ft.

UTAH

Emery County: English Oil Co.-American Petrofina 1 State, C NE SW 22-20s-7e. 1,300 M.c.f. of gas per day, Ferron gas discovery, new field. TD 1,700 ft. Dakota.

Grand County: Oil, Inc. et al 1 Federal, NE NE NE 13-17s-23e. IP 1,500 M.c.f. of gas per day. Dakota gas discovery, new field. TD 5,167 ft. Entrada.

San Juan County: Carter Oil Co. 1 Navajo-114, SW NW NW 8-41s-25e. IPF 2,330 BOPD, Paradox discovery, new field. TD 5,688 ft. Salt.

San Juan County: Shell 1 Tohonadla, W½ SW SW 35-41s-21e. IPF at the rate of 1,450 bbl. of oil in 8½ hours, 48/64-in. choke. Paradox discovery, new field. TD 6,345 ft. Ouray.

announcing . . .

the all-new

D&S TRI-DIA Core Bit!

Check these outstanding features:

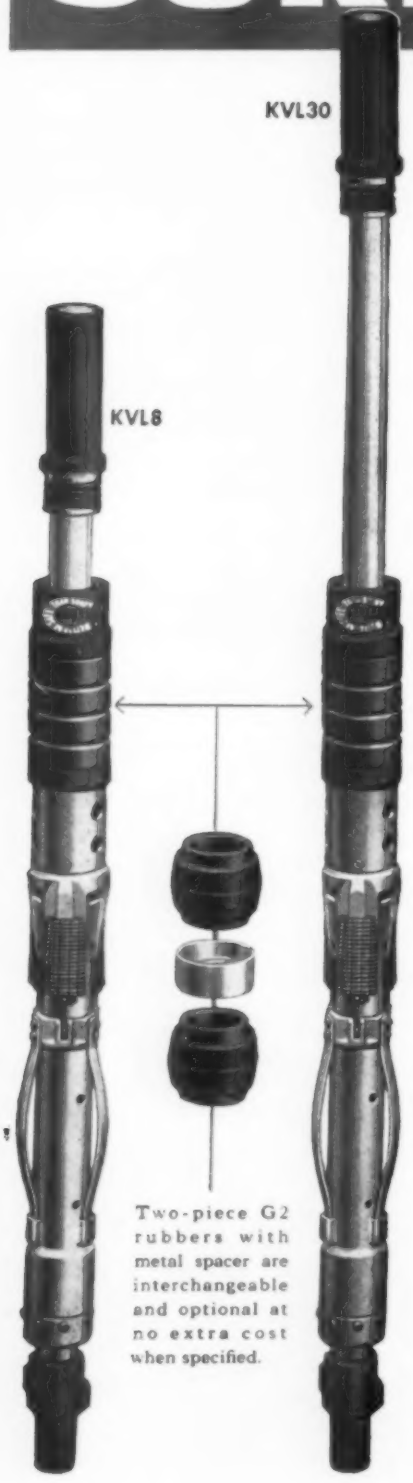
- Designed for safety.
- Reduced OD wall contact, similar to Tri-Cone Rock Bit.
- Reduces mud wall cake sticking hazard.
- When making trip, eliminates swabbing – hydraulic action.
- Minimizes junk iron hazard – allows washing out large pieces.
- Readily washes out cavings to bottom.
- Largest measurable diameter materially less than diameter of hole it will cut. (Special Bit Breaker required.)

WRITE OR CALL TODAY! One of the D & S sales engineers will call on you to show tremendous TRI-DIA Bit and Core Barrel advantages.

Drilling & Service INC. | DIAMOND DRILLING EQUIPMENT
6710 NORTH CENTRAL EXPRESSWAY | DALLAS, TEXAS
OFFICES IN ALL PRINCIPAL OIL AREAS

SAFE and SURE

GUIBERSON'S KVL PACKERS



Two-piece G2 rubbers with metal spacer are interchangeable and optional at no extra cost when specified.

With Automatic Latch

Operators who want extra assurance that a packer won't come unlatched going in, depend on Guiberson KVL packers. Rugged and durable, KVL packers have earned a reputation for dependable performance in deep and medium depth wells. These retrievable packers are easy to set and release, with ample bypass and positive seal. When running into a liner the KVL stays latched and drag springs provide an excellent guide — features operators like. For conserving gas energy and increasing production in flowing wells; for completing wells by circulation; for acidizing, repressuring and dozens of other uses, the KVL is unsurpassed.

- Made as the KVL30 with 30″ valve stroke or KVL8 with 8″ valve stroke for standard below-packer circulation. (Both packers also made with perforated mandrel for circulation above packer.) Available in casing sizes 5″ through 9⅝″.
- Valve has two independent sealing elements, a tapered metal valve and seat and a set of oil-resistant seal rings, affording double-sealed protection.
- Rubbers made of special oil and gas resistant compound. Will not vulcanize to casing — recover original shape when released.

THE GUIBERSON CORPORATION

ESTABLISHED 1919
DALLAS, TEXAS
U. S. A.

Sold by Oil Field Supply Stores Everywhere

Walker Is Elected by C.N.G.A.

IN ELECTING E. W. (Bill) Walker president of the California Natural Gasoline Association recently, the members not only picked a man with a solid background in their own particular part of the oil business, but a man with wide experience in many other phases of the industry.

Walker is divisional mechanical engineer for Western Gulf Oil Co. in Los Angeles. As president of C.N.G.A., he will head up an organization which has pioneered many important standardization programs in the natural-gasoline business. Walker succeeds outgoing C.N.G.A. president R. W. Todd of Pacific Lighting Gas Supply Co.

The C.N.G.A. standard procedures for measurement and sampling of natural gas, gasoline, and L.P.G. are recognized both in and out of the petroleum industry as pioneering standards of high quality. Each year many requests are received from all parts of the world for C.N.G.A. Standards Bulletins.

Currently, the C.N.G.A. is tabulating and evaluating results obtained from chromatographic equipment to see if these new instruments can be used to simplify gas-testing procedures.

An important part of C.N.G.A.'s program is to provide timely technical papers of interest to its members. And Walker will help direct this program.

E. W. WALKER
... From banana boat to roustabout.

Unlikely start . . . When it comes to compiling a list of unusual ways for getting into the oil business, Walker's experience should rank right up near the top.

He made the unlikely jump from crewman on a banana boat to oil-field roustabout. As a matter of fact, there were several other factors in his early life which seemed to point him in any direction except to the oil business.

First, he was born about as far from an oil field as a person could get at that time—New Zealand in 1908. And second, the electrical industry, not petroleum, seemed to have first call on his services.

Walker's family migrated to California in 1911, settling in the Santa Cruz area. A short residence in Palo Alto caused Walker to set his sights on going to Stanford University. He made it, majoring in mechanical engineering and graduating in 1930. He had aspirations for going on to aeronautical engineering, but people weren't buying many planes in those days so he was forced to give that up early.

Instead, he landed a job with General Electric Co. At the time he received his appointment with G.E., Walker was told that, due to the depression, he would be laid off at the conclusion of the 14-month study and work program G.E. had going then for engineering graduates.

During his stay at Schenectady, N. Y., and Erie, Pa., he worked on many electrical projects, including railway electrification, and completed G.E.'s business training course as well.

When his course ended at G.E., he returned to the West Coast at a time when engineering graduates were a drug on the market.

The first job Walker landed was as an electrician on a United Fruit Lines banana boat (electrically powered) plying between San Francisco and Panama. After five trips, the violent longshoremen's strike of 1934 broke out, shutting down all shipping, and put Walker back on the available-for-employment list.

When the strike ended, the shipping company offered Walker his old job back. But during his days on the beach, he and the former Gladys Izant of Santa Cruz, Calif., made wedding plans which didn't include a solo honeymoon by the groom on a banana boat.

So Walker signed on with Shell Oil Co. as a roustabout in the San Joaquin Valley. He worked his way through various drilling and production jobs, later taking an engineering job with the Kettleman North Dome Association during the early days of development of Kettleman Hills field.

These were busy times. Walker was involved with the design and construction of pipelines, production, gathering and storage facilities, and gas compressor stations. Subsequently, he became superintendent of gas operations.

In 1943 he was named area mechanical engineer for Western Gulf, operating out of Bakersfield. He later transferred to Los Angeles where he is now divisional mechanical engineer for Western Gulf.

The Walkers live in Altadena. Walker and his wife have two children, a daughter, Ann, 15, a student at Pasadena High School, and a son, Edward, 18, who is headed for Stanford.

W. F. Johnston has been named senior chemical engineer for American Oil Co. in Texas City, Tex. Johnston will continue as group leader in the research and development department.

Knox E. Davis has left Hanley Co. where he was production engineer in Midland, Tex., to join Ashland Oil & Refining Co. in Oklahoma City in the same capacity.

R. W. Johnston, junior engineer with Sohio Petroleum Co. in Oklahoma City, has been transferred to Casper, Wyo., in the same capacity. **Robert L. Knox,** engineer trainee, has been transferred to Oklahoma City from Pauls Valley, Okla.

Rex L. Hardaway has joined Slick Secondary Recovery Corp. of San Antonio, Tex., as petroleum engineer. He will be responsible for production operations, which are mainly in South Texas. Hardaway was formerly district engineer at McAllen, Tex., for Delhi-Taylor Oil Corp.

A. W. Conover, president of Equitable Gas Co., Pittsburgh, has been nominated for president of the American Gas Association. A.G.A. officers will be elected at the October 7-9 annual convention of the association in St. Louis. Also nominated for office are **Robert W. Otto,** Laclede Gas Co., first vice president; **J. Theodore Wolfe,** Baltimore Gas & Electric Co., second vice president; and **Vincent T. Miles,** Long Island Lighting Co., treasurer. **C. H. Zachry** of Southern Union Gas Co., is president this year. He will become a director next year.

Personals

C. C. HARTER

C. C. (Mike) Harter has been named president of Heritage Petroleum Corp., new Dallas company organized by Harter and **Clinton Davidson** of Barnardsville, N. J. Heritage plans to buy production in the Southwest. Harter was formerly executive vice president of Oil & Gas Property Management, Inc., and has also been with Bradley, Crichton & Associates, and DeGolyer & MacNaughton.

G. T. Dierking, engineer with Ford, Bacon & Davis, Inc., has been transferred to Baltimore from Memphis.

R. E. Kastor, Shell Oil Co. mechanical engineer, has been transferred to New Orleans from Houston.

Bert E. Crowder, district production superintendent with Humble Oil & Refining Corp., has been transferred to Crowley, La., from Athens, Tex.

R. D. Coles, Jr., has been named exploitation engineer with Shell Oil Co. in Houston. Coles was formerly junior exploitation engineer.

W. C. Todt, Gulf Oil Corp.'s district production manager in Odessa, Tex., has been transferred to Midland, Tex., in a move changing district headquarters of the company.

Rodney Bell, Jr., has been transferred by Continental Oil Co. from Lake Charles, La., where he was area engineer, to the company's Denver refinery as resident engineer.

George T. Hansen, Jr., Utah Southern Oil Co., has been elected president of the Salt Lake City Petroleum Club. Other officers include **Clyde L. Anderson,** Christensen Diamond Production Co., first vice president; **Larkin O'Hern,** Sinclair Oil & Gas Co., second vice president; **Melvin E. Leslie,** Skyline Oil Co., secretary; and **Darrell E. Smith,** Pan American Petroleum Corp., treasurer. Directors include the officers and **Ed D. Knight, Jr.,** Riley's Reproduction Co.; **N. G. Morgan, Jr.,** Oil Securities & Gas Corp.; **J. R. Williams,** J. R. Williams Oil Brokerage; **Dorsey Hager,** Salt Lake City consulting geologist; **J. B. Guinand,** Walton-Kearns; and **William I. Harris,** Christensen Diamond Production.

Mark R. White has been transferred by Sun Oil Co. from Seabreeze, Tex., to Chacahoula, La., as junior petroleum engineer.

Otis M. Solomon has joined Barnwell Offshore, Inc., in Shreveport, La., as general superintendent. Solomon formerly was tool pusher with Penrod Drilling Co. in Buras, La.

Kenneth H. Faulk has been named section leader in the special projects section of Cities Service Research & Development Co.'s Lake Charles, La., process research laboratory.

John H. Dea, who has been assistant to The Texas Co.'s vice president, foreign operations department, Western Hemisphere and West Africa, since 1955, has been appointed assistant to the president. Dea has been with Texaco since 1937.

Herbert G. Dye has been appointed district foreman of the Coleman, Tex., district of the Climax-Brundred waterflood division of Climax Molybdenum Co. He will be responsible for waterflood operation of the East Goldsboro unit recently obtained by his company. Dye was formerly with General American Oil Co. of Texas.

Tom Greene has been appointed vice president and assistant to the president of Signet Drilling Co., Corpus Christi, Tex. He will supervise production and drilling for Signet, Manco Corp., and Calvert & Manley. Greene has been drilling and production superintendent for W. A. Richardson Oil Co. since 1950. He was with The Texas Co. as petroleum engineer before that time.

C. W. Hamilton, vice president of Gulf Oil Corp. and chairman of the board of Gulf Eastern Co., London, retired June 1. Hamilton has been with Gulf and its subsidiaries since 1916 when he joined Mexican Gulf Oil Co. as chief geologist. He was elected Gulf Oil Corp. vice president in charge of foreign exploration and production in 1940. He became chairman of Gulf Eastern in 1955.

Val R. Reese has resigned as chief geologist for Pacific Northwest Pipeline Corp. and manager of land and geology departments for its subsidiary, Northwest Production Corp., to become a consultant. Reese was exploration geologist with Phillips Petroleum Co. before joining Pacific Northwest in 1954. **R. W. Reed** will succeed Reese as chief geologist with Pacific Northwest and **R. H. Nordhausen** has been named land manager of Northwest Production.

M. O. Atkins has been transferred by Penrod Drilling Co. to Houma, La., from Port Sulphur, La., as tool pusher.

Steve Rainwater, production foreman with Continental Oil Co., has been transferred to Driscoll, Tex., from Rincon, Tex.

David K. Hayward has been transferred by The Texas Co. from Long Beach, Calif., to Santa Paula, Calif., as district petroleum engineer.

Charles D. Davidson, Pawhuska, Okla., consultant, has joined Phillips Petroleum Co. in Bartlesville, Okla., as senior reserves engineer.

W. G. Abbott has left Amerada Petroleum Corp. to join Rice Engineering & Operating, Inc., as Texas-New Mexico division manager in Hobbs, N. M. Abbott was New Mexico district engineer for Amerada at Monument, N. M.

C. W. Coote has been transferred by British American Oil Co., Ltd., from Edmonton, where he was manager of the company's refinery, to Port Moody, B. C., as manager of British American's new refinery there. **R. E. Harris,** assist-

R. E. HARRIS

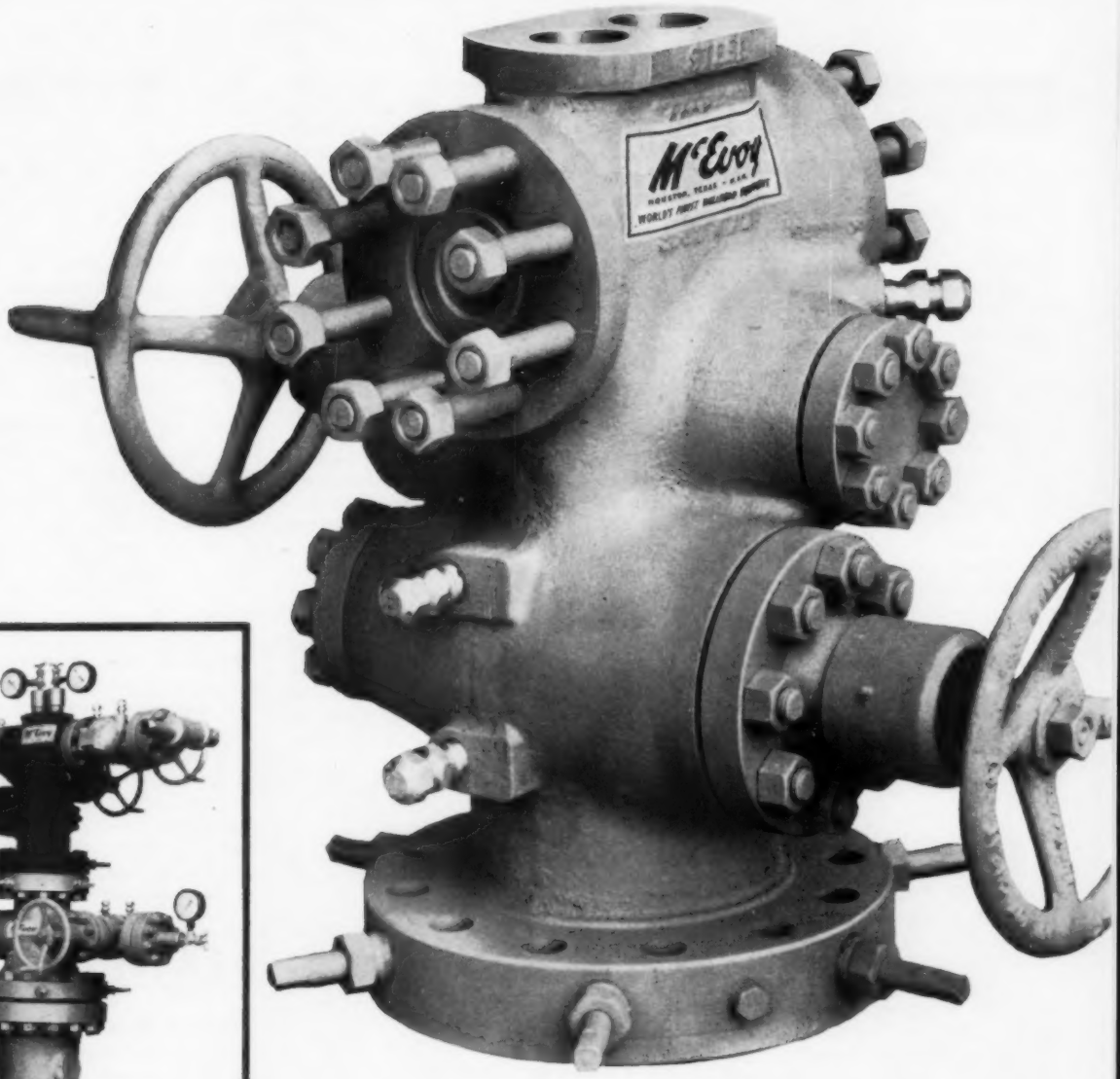
C. W. COOTE

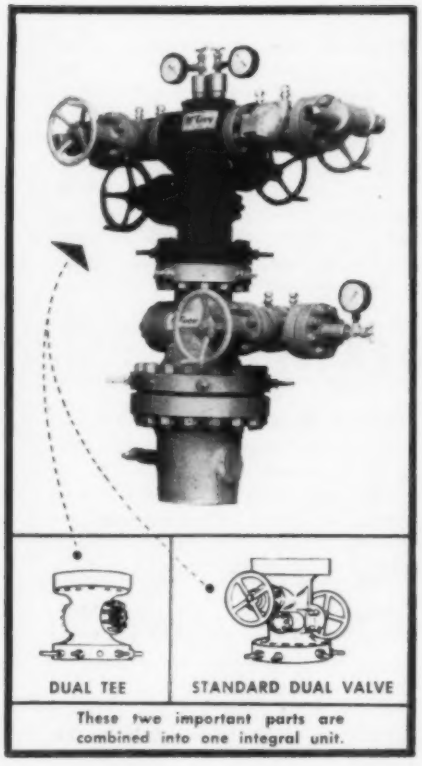
ant manager of the refinery at Moose Jaw, Sask., will replace Coote as manager at Edmonton. **H. A. Hornfelt,** assistant manager of the company's Calgary refinery, has been named construction superintendent of the Port Moody refinery project. **J. L. Stoik,** operating superintendent at Moose Jaw, moves up to assistant manager replacing Harris.

John D. Dutton, petroleum engineer with Anderson-Prichard Oil Corp. at Oklahoma City, has been transferred to Great Bend, Kans., in the same capacity.

G. D. Robertson, manager of Shell Oil Co.'s Houston production division since 1948, has retired after 23 years with the company.

James T. Carter, Jr., acting chief engineer of Pacific Lighting Gas Supply Co., Los Angeles, has joined Pacific Northwest Pipeline Corp. as superintendent of compressor stations. Carter will headquarter in Salt Lake City.





McEvoy Combines Dual Valve & Dual Tee...

for a NEW concept in wellhead design

For the first time, McEvoy has combined a dual bore master valve and the adjoining dual tee into one integral unit, reducing both the size and weight of this equipment. This new basic Christmas Tree design completely eliminates one major flanged connection.

All valve internal working mechanisms are identical to the proven self-sealing McEvoy Gate Valves, engineered and designed to meet the most rigorous field requirements. The dependable McEvoy multiple string packoff (externally adjustable at any time by use of "lock screws") is utilized in this Dual Integral Valve. This packoff prevents any co-mingling of fluids and can be fully tested before bringing in the well.

The Integral Dual Valve with Tee (Type "DVT") is full bore for complete vertical access to either tubing string for all wire line operations. Available in 3,000, 5,000 and 10,000 p.s.i. working pressure ratings, in sizes as required by the industry.

McEvoy COMPANY

OIL WELL EQUIPMENT

Texas and Milby St., P. O. Box 3127, Houston 1, Texas

Personals

R. W. EDMUND

Rudy W. Edmund has been named general manager of the production department of Standard Oil Co. (Ohio) with responsibility for the exploration and production operations of the company and its subsidiaries. He has also been elected a vice president of Sohio Petroleum Co. Rudy succeeds **Richard W. French, Jr.,** who recently was elected president of United Carbon Co. Edmund has been with Sohio since 1953. He became assistant general manager of production last year. He will headquarter in Oklahoma City.

Jonathan W. Phillips has joined Neese Exploration Co. of Houston as chief geophysicist in charge of gravity interpretation. Phillips was geophysicist with Sohio Petroleum Co. and a consultant before joining Neese Exploration.

W. A. (Al) Hiles has been named chief geologist for Royalite Oil Co., Ltd. **D. G. Penner** has been appointed division geologist and **W. R. Englebright,** division geophysicist. All three will headquarter in Calgary.

I. D. Davidson, president of Canadian Shell, Ltd., has been elected a director of Shell Petroleum Co., Ltd., and Bataafsche Petroleum Maatschappij. Davidson was president of Cia. Shell de Venezuela before going to Canada earlier this year.

Clifford B. Coker has been transferred by Midstates Oil Corp. from Odessa, Tex., where he was West Texas-New Mexico district superintendent, to Dickinson, Tex., as Gulf Coast area superintendent. He succeeds the late A. W. Jones. **G. W. Gilbert,** assistant district superintendent at Dickinson, has transferred to Odessa to succeed Coker.

William G. Cutler has been named manager of production operations and reservoir engineering department of Pacific Northwest Pipeline Corp. Cutler has been petroleum engineer with Pacific since 1955. In his new position he succeeds **L. G. Truby, Jr.,** who was recently promoted to manager of production. **T. A. Dugan,** formerly with Phillips Petroleum Co., has been appointed San Juan basin division manager for Pacific Northwest. He replaces **Oliver W. Fowler.**

Richard W. Waldsmith has been promoted by Aurora Gasoline Co. from shift superintendent at the company's Muskegon, Mich., refinery, to process engineer there.

A. J. Thaman has been promoted by Humble Oil & Refining Co. from assistant superintendent of oil movements to superintendent of the division at Humble's Baytown, Tex., refinery. **B. D. Jones** will succeed Thaman as assistant superintendent.

Charles DeLay, assistant general superintendent in Venezuela for Atlantic Refining Co., has joined Helmerich & Payne, C.A., newly formed Venezuelan subsidiary of Helmerich & Payne, Inc., as superintendent of operations in Venezuela.

P. H. N. White, division exploration manager at Regina for Imperial Oil, Ltd., has been named assistant regional exploration manager with headquarters in Calgary. **R. G. Lill,** assistant division exploration manager at Regina, moves up to succed White. **Frank K. Spragins,** regional contracts supervisor in Calgary, has been transferred to Regina to replace Lill.

J. E. Anderson, purchasing agent in New York for BP Trading Co., Ltd., for the past 15 years, is returning to London to a position with British Petroleum Co., Ltd. Anderson has been ranking BP representative in the United States. He will be succeeded by **W. C. Connel** in the New York office.

Charles A. Wischoff, Shell Oil Co. exploitation engineer in Tulsa, has been transferred to Amarillo, Tex., as head of the company's new district production office there. Also assigned to Amarillo are **M. H. Verwest,** exploitation engineer in the Illinois division; and **S. W. Goodwin,** production foreman; **S. J. Cerny,** exploitation engineer; and **W. F. Allman,** mechanical engineer; all transferred from the Woodward, Okla., district.

John E. Harris, Jr., has been appointed manager and **H. J. Horsch,** assistant manager of Phillips Petroleum Co.'s new supply division of the supply and transportation department. The new division combines the crude oil supply division, formerly headed by Harris, and the products supply division, headed by Horsch. **John L. Kyser,** formerly coordinator, has been promoted to assistant to the manager of supply and transportation department. **H. J. Classick,** assistant coordinator, replaces Kyser, and **R. M. Berner** succeeds Classick as assistant coordinator.

H. J. O'Shea has been appointed chief geologist of Canadian Export Gas, Ltd.

Wallace K. Reaves, geologist with Continental Oil Co., has been transferred to Jackson, Miss., from Forest, Miss.

Hugh T. Richardson has been named chief geologist for Standard Oil Co. of Texas. He will headquarter in Houston. Richardson has been chief geologist for The California Co. in New Orleans since 1953.

Fred H. Lindall has been elected president of Petty Geophysical Engineering Co. He will also head two subsidiaries, Petty Laboratories, Inc., and Petty Geophysical Co. A graduate of the University of Illinois and the University of Chicago, Lindall was formerly with Anderson-Prichard Oil Corp.

Louis F. Goss, district geologist for Seaboard Oil Co. in Abilene, Tex., has been transferred to Midland, Tex. Others transferred by Seaboard, which will close its Abilene land and geological offices September 1, include **James R. Jackson,** geologist, and **Bob Todd,** scout, also transferred to Midland; **Al Tonn,** geologist, transferred to Ardmore, Okla.; and **John Sample,** geologist, who has been moved to Amarillo.

DEATHS

Herbert H. Reed, 59, San Marino, Calif., leasing supervisor in the exploration department of Standard Oil Co. of California, died July 6 after a long illness. Reed had been with Socal for 37 years, the last 26 in the Los Angeles office.

Robert R. Stacy, 27, Omaha, Neb., geologist for Creole Oil Co., was killed recently in an automobile accident in Venezuela. Stacy joined Creole last February after receiving his master's degree from the University of Nebraska.

D. W. Spencer, Abilene, Tex., independent, died July 5 in Fort Worth. He was 61. Spencer was with Sinclair Oil Corp. for 27 years before becoming an independent. His brother, **P. C. Spencer,** is president of Sinclair.

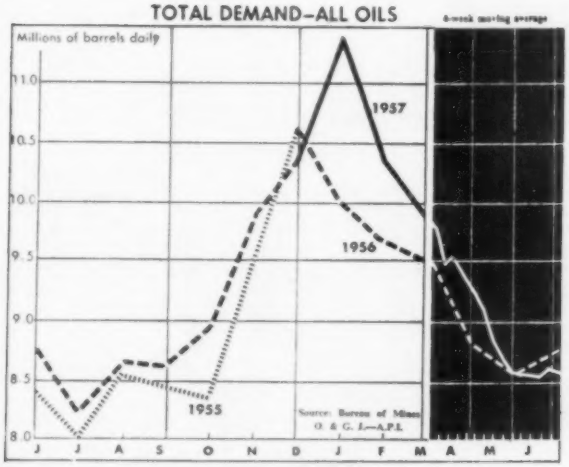
Gordon D. Bachemin, president and general manager of Petrol-Structors, Ltd., pipeline design consultants, died June 27 after a long illness.

Clinton E. Nearhood, 41, geologist with Continental Oil Co., died July 6 in Ardmore, Okla., after a heart attack.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,964,675	DOWN	252,100	DOWN	118,348
Crude stocks	277,283,000	UP	4,091,00	UP	2,606,000
Completions	1,047	UP	172	DOWN	204
Refinery runs	7,840,000	DOWN	75,000	DOWN	134,000
Gasoline stocks	185,920,000	DOWN	2,603,000	UP	7,371,000
Kerosine stocks	28,597,000	UP	385,000	UP	1,837,000
Distillate stocks	119,592,000	UP	4,595,000	UP	21,303,000
Residual stocks	46,248,000	UP	1,586,000	UP	6,469,000
Four-product stocks	380,357,000	UP	3,963,000	UP	36,980,000
Total imports	1,640,600	DOWN	143,300	UP	225,400



Gulf Coast Markets Shift—Gasoline Is Stronger, Distillate Is Weaker

THE BIG INCREASE in middle-distillate stocks on the East Coast since last year is at least a partial explanation for soft markets on the Gulf and East Coasts.

Total stocks of kerosine and distillate fuels increased 23,240,000 bbl. The East Coast area accounted for 12,846,000 bbl. of the total gain.

Both kerosine and distillate markets are very weak on the Gulf Coast, and prices have been reduced again on the East Coast. On the Gulf Coast No. 2 fuel is available at 9.00 cents a gallon for immediate lifting. There is no accurate gage to show the rock-bottom price for a cargo of No. 2 or kerosine, since there have been no big buyers active in the market. General market rumors on the Gulf Coast indicate that someone with an empty tanker ready to load could fill it with No. 2 for less than 9.00 cents a gallon.

On the East Coast, Esso Standard Oil Co. announced a net reduction of 0.40 cent a gallon for kerosine, No. 2, and diesels in the New York Harbor area. The cut was accomplished by lowering the posted price by 0.70 cent a gallon and reducing the voluntary allowance from 0.80 cent to 0.50 cent a gallon.

Spot gasoline on the Gulf Coast is beginning to show a little strength. The general gasoline market in the area is up about 0.25 cent a gallon. This means the low for 92-octane regular is about 11.25 cents a gallon.

The tables below show comparisons of current stocks with inventories at this time of the year, back to 1954. Note the big gains in gasoline for the past 2 years. Last year's distillate stocks were a little low.

Refinery runs averaged 7,840,000 bbl. daily for week ended July 5. High inventories show the need for reduced refinery runs this month.

GASOLINE STOCKS
(Thousands of barrels)

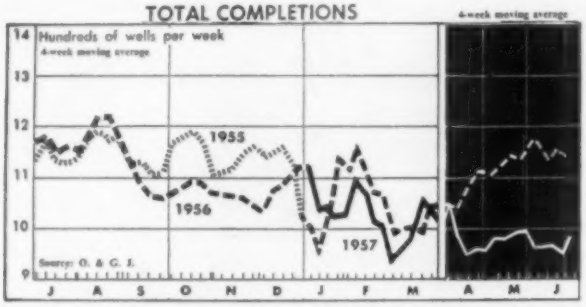
	6-28-57	6-30-56	6-30-55	6-30-54
East Coast	42,370	39,691	35,666	36,471
Appalachian 1	5,098	4,350	4,206	4,314
Appalachian 2	2,604	2,853	2,428	2,692
Ill., Ind., Ky.	33,166	31,850	33,073	36,844
Minn., Wis., Dak.	6,345	6,374	(*)	(*)
Okla., Kans., Mo.	16,439	15,472	15,086	17,258
Inland Texas	7,306	6,852	5,758	6,481
Texas Gulf Coast	25,810	24,880	21,145	19,948
La. Gulf Coast	10,922	10,170	9,636	8,686
N. La. and Ark.	4,208	4,207	3,489	3,713
New Mexico	374	441	188	216
Other Rocky Mtn.	7,185	6,748	6,879	7,918
West Coast	26,696	23,188	19,885	20,863
Total U. S.	188,523	177,076	157,439	165,404

MIDDLE DISTILLATE STOCKS
(Thousands of barrels)

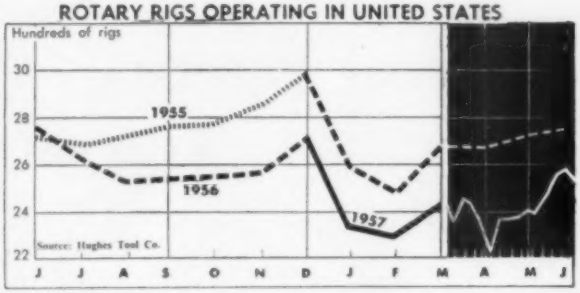
	6-28-57	6-30-56	6-30-55	6-30-54
East Coast	50,471	37,625	44,520	40,028
Appalachian 1	2,936	2,236	2,582	2,052
Appalachian 2	1,279	1,306	1,353	1,104
Ill., Ind., Ky.	22,611	17,997	25,988	22,195
Minn., Wis., Dak.	5,952	5,719	(*)	(*)
Okla., Kans., Mo.	12,142	11,261	12,953	11,474
Inland Texas	2,585	2,090	2,252	2,104
Texas Gulf Coast	17,453	17,505	16,920	12,708
La. Gulf Coast	9,289	8,484	8,035	6,757
N. La. and Ark.	2,605	2,199	2,670	1,834
New Mexico	85	138	63	106
Other Rocky Mtn.	3,150	3,029	2,616	2,431
West Coast	12,651	10,280	10,530	11,716
Total U. S.	143,209	119,869	130,482	114,509

*Included in Ill.-Ind. and Okla.-Kans. districts.

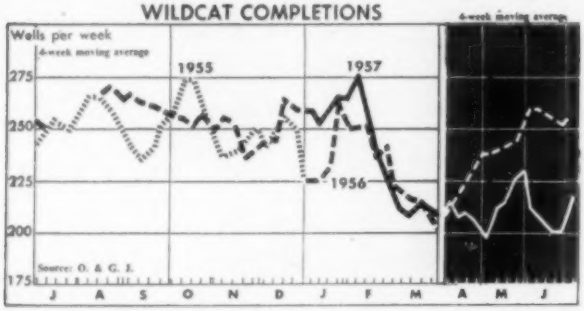
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROATRY RIGS*

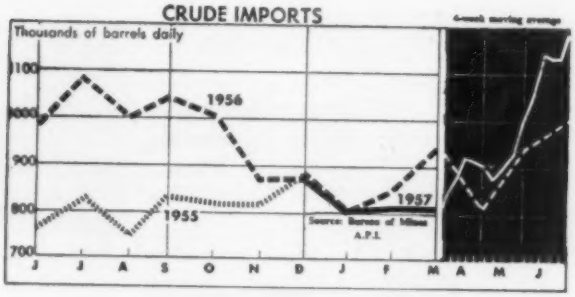
Area—	7-8-57	7-1-57	7-19-56
North Central and East	115	126	145
Southeast	46	51	29
Okla., Kans., Ark., Mo.	449	406	464
Louisiana	397	406	452
North and East Texas-Panhandle	419	437	407
Gulf and South Texas	201	213	251
West Texas-New Mexico	550	567	518
Rocky Mountain	257	269	275
Pacific Coast	107	111	131
Total United States	2,541	2,580	2,672
Canada	222	216	236

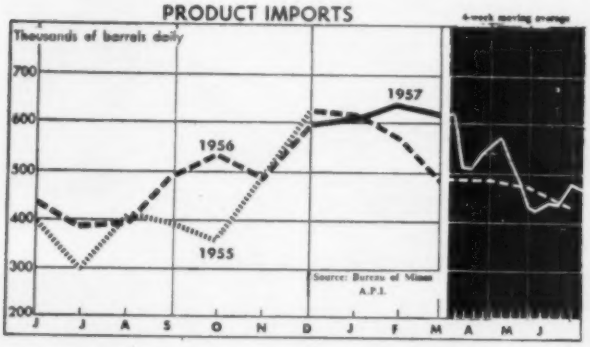
*Hughes Tool Co.

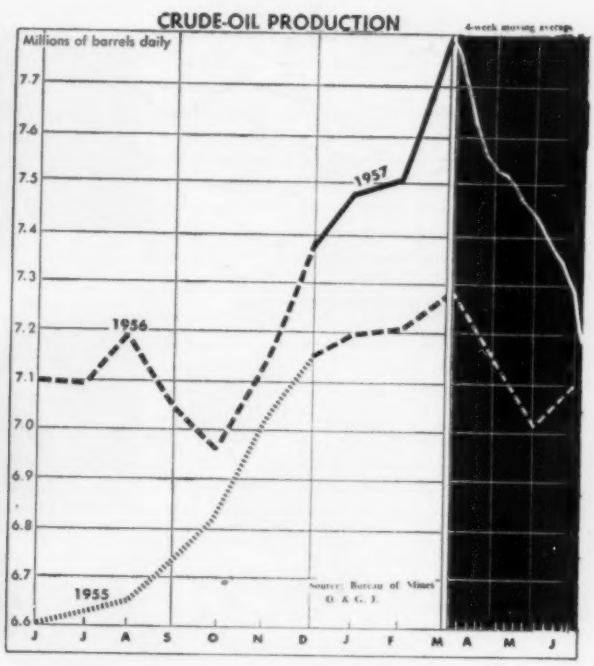
WEEKLY WELL COMPLETIONS . . . WEEK ENDED JULY 6, 1957

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1957				
	Comp.	Oil	Gas	Dry	Footage	1957	1956	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	†1	1	0	0	11,044	58	58	0	0	0	0	0	0	0	1	20	21
Arkansas	38	20	0	18	112,523	529	403	0	0	0	7	7	12	0	5	80	97
California	27	20	0	7	98,851	1,072	1,123	1	0	0	4	5	31	0	5	225	261
Colorado	20	3	2	15	102,431	434	611	2	0	0	12	14	16	0	9	270	295
Illinois	49	20	0	29	118,009	1,235	1,885	1	0	0	12	13	15	0	1	289	305
Indiana	9	2	0	7	14,636	311	326	0	0	0	2	2	6	0	0	58	64
Kansas	76	32	8	36	270,791	2,104	2,636	0	0	0	16	16	52	0	17	347	416
Kentucky	32	11	3	18	45,371	698	876	0	0	0	7	7	14	0	5	119	138
Louisiana	76	43	6	27	594,850	1,929	2,013	2	0	2	10	14	41	9	52	250	352
North	32	13	2	17	122,137	646	826	0	0	0	5	5	7	0	5	72	84
South	35	25	2	8	378,823	912	955	2	0	2	5	9	24	8	39	151	222
Offshore	9	5	2	2	93,890	371	232	0	0	0	0	0	10	1	8	27	46
Michigan	5	3	0	2	14,560	200	235	0	0	0	0	0	9	0	0	74	83
Mississippi	4	0	0	4	28,109	189	230	0	0	0	1	1	10	1	0	85	96
Montana	5	4	0	1	12,792	187	182	0	0	0	1	1	6	0	0	59	65
Nebraska	22	5	0	17	123,299	412	548	0	0	0	15	15	20	0	1	213	234
New Mexico	38	19	13	6	153,581	1,067	961	1	0	0	3	4	33	1	8	100	142
Northwest	20	4	13	3	83,329	399	372	1	0	0	2	3	13	1	6	30	50
Southeast	18	15	0	3	70,252	668	589	0	0	0	1	1	20	0	2	70	92
New York	9	4	0	¶5	9,250	230	...	0	0	0	0	0	0	0	1	0	1
North Dakota	5	3	0	2	38,692	141	124	0	0	0	1	1	6	0	0	50	56
Ohio	28	16	2	‡10	55,826	547	534	0	0	1	0	1	1	0	1	3	5
Oklahoma	82	47	3	§32	332,540	3,158	4,475	0	0	0	7	7	50	10	9	292	361
Pennsylvania	0	0	0	0	0	353	*613	0	0	0	0	0	0	0	15	20	35
Texas	490	312	12	166	2,151,997	11,097	11,394	5	0	1	101	107	320	39	97	2,326	2,782
Southwest (1 & 4)	55	31	2	22	224,342	1,380	1,669	0	0	1	12	13	38	12	27	397	474
Gulf Coast (2 & 3)	50	22	3	25	333,571	1,306	1,388	0	0	0	12	12	26	17	44	328	415
East (5 & 6)	25	18	0	7	115,054	643	583	0	0	0	5	5	6	3	2	186	197
N. Central (7-B & 9)	155	73	2	80	489,953	3,883	4,109	2	0	0	50	52	168	0	14	993	1,175
West (7-C & 8)	168	139	1	28	842,390	3,171	2,985	3	0	0	18	21	77	0	8	386	471
Panhandle (10)	37	29	4	4	146,687	714	660	0	0	0	4	4	5	7	2	36	50
Utah	11	3	1	7	57,179	99	67	1	0	1	5	7	8	0	4	44	56
West Virginia	6	0	5	1	21,699	311	336	0	0	1	0	1	0	0	9	5	14
Wyoming	13	4	0	9	54,958	412	399	1	0	0	4	5	14	0	3	120	137
Miscellaneous (S. D.)	1	0	0	1	723	35	60	0	0	0	1	1	0	0	1	26	27
Total United States	**1,047**	572	55	420	4,423,711	26,808	30,089	14	0	6	209	**229**	664	60	244	5,075	6,043
Total previous week	875	436	68	371	3,706,521	...	...	23	2	9	180	214	650	60	238	4,866	5,814
Total July 7, 1956	1,251	650	97	504	4,775,930	...	...	28	1	11	218	258	804	68	217	5,471	6,560
Cumulative, 1957	26,808	14,361	1,933	10,514	112,168,578	...	...	...	...	...	...	...	...	...	...	...	...
Western Canada	86	52	12	22	389,498	1,513	1,377	4	0	3	16	23	42	0	35	336	413

*Incl. N. Y. †Ala. Service wells included: ‡3, §6, ¶5.



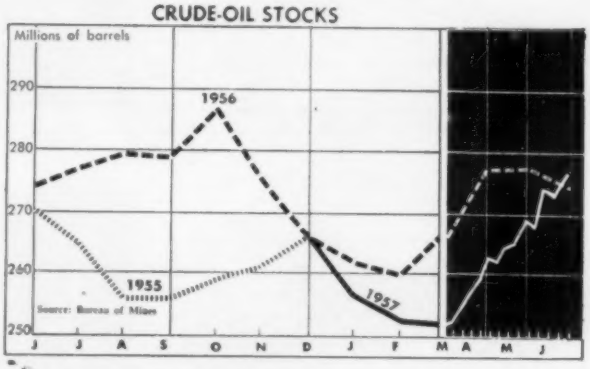




DAILY AVERAGE PRODUCTION FOR WEEK

	July 6, 1957 Crude oil	Lease condensate	Total	June 29 total
Alabama	12,550	.....	12,550	12,600
Arkansas	85,000	300	85,300	85,600
California	924,600	.....	924,600	925,900
Colorado	148,900	.....	148,900	148,600
Eastern	51,800	.....	51,800	52,200
Florida	1,325	.....	1,325	1,275
Illinois	160,800	.....	160,800	155,000
Indiana	28,000	.....	28,000	28,500
Kansas	†330,000	.....	†330,000	†334,600
Kentucky	39,600	.....	39,600	39,900
Louisiana	804,700	75,200	879,900	882,700
North	131,850	3,200	135,050	135,200
South	672,850	72,000	744,850	747,500
Michigan	25,700	.....	25,700	24,900
Mississippi	110,275	4,200	114,475	115,100
Montana	74,350	.....	74,350	74,600
Nebraska	51,650	.....	51,650	51,800
Nevada	100	.....	100	100
New Mexico	253,925	4,400	258,325	263,000
North Dakota	40,700	.....	40,700	36,700
Oklahoma	†551,200	.....	†551,200	†566,300
Texas	2,829,700	53,700	2,883,400	3,105,000
Dist. 1	52,425	450	52,875	53,950
Dist. 2	131,150	8,450	139,600	152,350
Dist. 3	410,000	26,500	436,500	461,200
Dist. 4	215,425	6,100	221,525	235,100
Dist. 5	37,150	300	37,450	40,300
Dist. 6	125,700	6,300	132,000	141,400
East Texas Field	180,700	.....	180,700	200,000
Dist. 7-B	155,575	50	155,625	167,075
Dist. 7-C	146,575	3,650	150,225	166,600
Dist. 8	1,066,425	1,100	1,067,525	1,171,100
Dist. 9	204,425	500	204,925	213,600
Dist. 10	104,150	300	104,450	102,325
Utah	8,000	.....	8,000	7,600
Wyoming	293,900	.....	293,900	304,700
Others	‡100	.....	‡100	‡100
Total U. S.	6,826,875	137,800	**6,964,675**	7,216,775
Change from prev. week, down			**252,100**	
Canada	†520,500	.....	†520,500	†548,960
Total U. S. production—Jan. 1-July 6				1,403,570,700 bbl.
Same period last year (crude plus cond.)				*1,346,645,086 bbl.

*Includes 23,681,880 bbl. condensate. †Week ended previous Monday. ‡South Dakota.



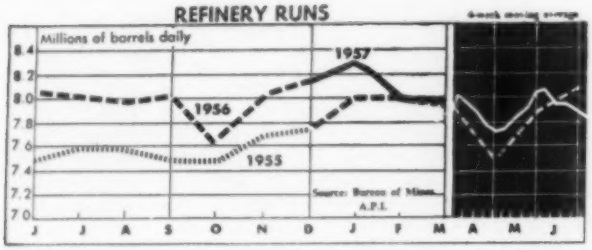
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

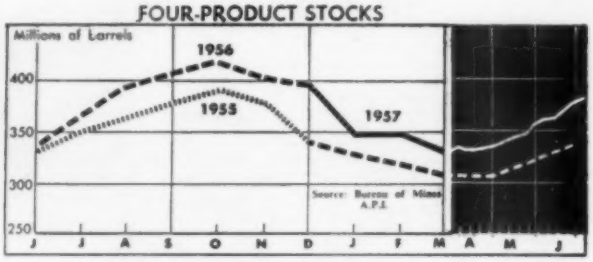
	6-29-57	6-22-57	6-30-56
Pennsylvania Grade	2,812	2,800	2,665
Other Appalachian	1,749	1,739	2,395
Illinois, Indiana, Michigan	9,858	9,446	11,686
Nebraska, North Dakota	2,568	2,224	2,340
Kansas	10,896	11,015	8,938
Oklahoma	21,700	21,133	25,922
Arkansas	2,748	2,622	2,937
Louisiana	18,249	18,465	15,440
North	2,727	2,770	2,490
South	15,522	15,695	12,950
Mississippi	3,110	2,580	2,878
New Mexico	7,615	7,785	7,284
Texas	128,858	128,628	123,056
East Texas proper	11,613	11,674	9,311
West Texas	60,555	61,884	60,093
Texas Gulf	24,579	24,133	21,518
Other Texas	32,111	30,937	32,134
Wyoming	17,868	16,649	19,013
Other Rocky Mountain	6,030	6,011	7,187
California	27,702	26,937	28,523
Foreign	†15,520	15,158	14,413
Total	277,283	273,192	274,677

*Bureau of Mines. †Includes 2,876,000 bbl. in California.

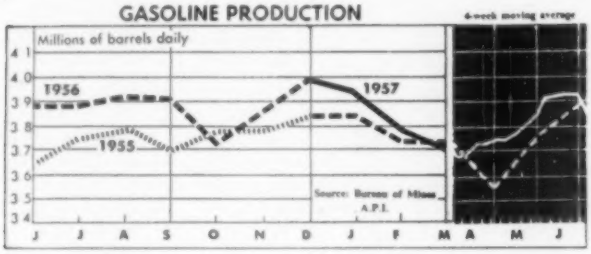
REFINERY RUNS



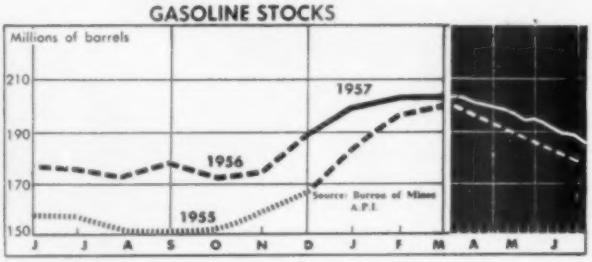
FOUR-PRODUCT STOCKS



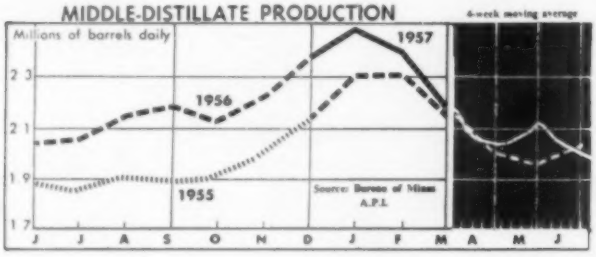
GASOLINE PRODUCTION



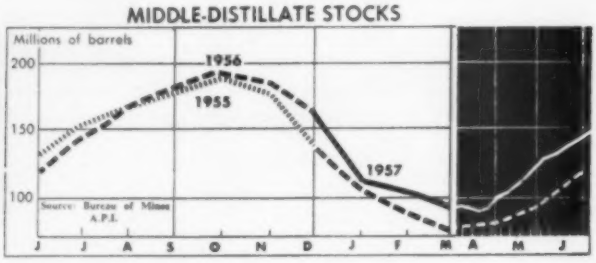
GASOLINE STOCKS



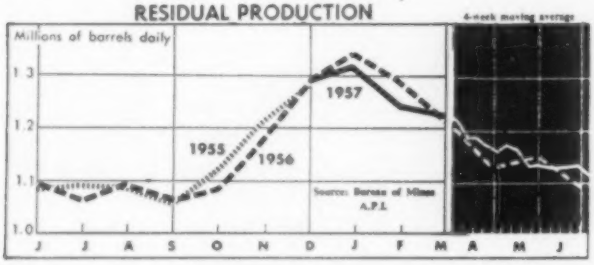
MIDDLE-DISTILLATE PRODUCTION



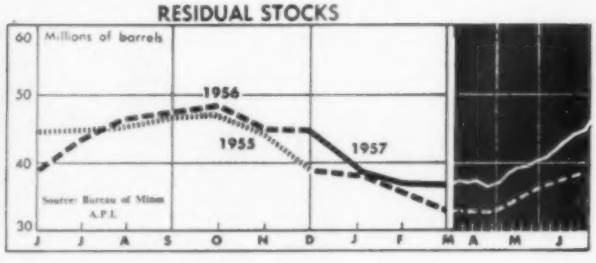
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, JULY 5, 1957

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, July 1956—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,313	494.1	12.4	339.7	262.0	42,328	11,244	41,267	11,569	1,164	472.5	26.2	313.4	196.9
Appalachian:														
District 1	112	48.3	2.6	23.9	4.3	4,901	555	2,408	493	107	42.2	4.4	24.2	5.5
District 2	43	28.7	1.4	7.4	6.4	2,569	522	815	249	100	53.3	4.6	14.3	11.9
Ind., Ill., Ky.	1,288	653.0	58.3	259.0	152.7	33,102	5,419	17,825	5,928	1,375	718.2	79.7	261.4	144.5
Minn., Wis., Dak.	106	51.3	5.6	32.1	9.0	5,968	1,085	5,523	414	92	46.7	7.2	24.3	4.0
Okla., Kans., Mo.	722	414.9	12.1	171.1	33.2	16,563	1,523	10,978	1,000	724	390.6	18.7	162.9	27.3
Inland Texas	276	207.1	7.0	50.0	22.7	7,108	389	2,381	1,852	273	193.9	10.1	42.8	24.3
Texas Gulf Coast	1,829	825.2	77.9	465.2	228.6	25,006	3,335	14,358	6,403	1,914	926.5	91.5	479.9	251.1
La. Gulf Coast	631	343.1	55.2	167.7	40.7	10,713	3,078	6,309	1,458	713	359.7	39.7	181.9	40.9
N. La. and Ark.	87	26.4	5.4	19.3	6.3	4,134	800	1,909	118	103	37.9	6.8	22.9	6.2
Rocky Mountain:														
New Mexico	30	14.0	0.7	5.0	3.1	376	9	84	68	25	13.0	0.3	4.7	3.6
Other Rocky Mtn.	283	135.9	2.4	63.7	33.3	7,022	251	2,969	1,154	281	131.7	2.5	67.1	27.9
California	1,120	454.6	8.0	173.9	302.0	26,130	387	12,766	15,542	1,143	491.3	4.1	167.1	321.6
July 5, 1957	7,840	3,696.6	249.0	1,778.0	1,104.3	185,920	28,597	119,592	46,248	8,014	3,877.5	295.5	1,766.9	1,065.7
June 28, 1957	7,915	3,905.6	254.7	1,819.6	1,150.3	188,523	28,212	114,997	44,662	.....	.....	.....	.....	.....
July 6, 1956	7,974	3,962.3	289.7	1,776.3	1,096.7	178,549	26,760	98,289	39,779	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (89 octane)	11.25-11.75
Premium (98 octane)	14.00-14.50
Gulf Coast (cargoes for coastwise or export movements):	
★ Regular (90 octane)	11.00-11.50
★ Regular (92 octane)	11.25-11.75
★ Premium (97 octane)	13.00-13.50
★ Premium (98 octane)	13.25-13.75
California (rack):	
Regular (88 octane)	13.1
Premium (96 octane)	15.1
★ Premium (98 octane)	15.8
Caribbean area (cargoes):	
Regular (87 octane)	10.875
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.0
Breckenridge:	
Grade 26-70	3.5

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.75-10.25
Diesel oil (58 d.i. and above)	9.375-9.75
Distillate No. 1	9.375-9.75
Distillate No. 2	8.75-9.125
Gulf Coast (cargoes):	
★ Kerosine 41-43	9.125-9.75
★ Distillate No. 2	9.00-9.50
New York Harbor (barges):	
★ Kerosine 41-43	11.15
★ Distillate No. 2	10.65
★ Diesel fuel, 48-52 d.i.	10.95
Caribbean area (cargoes):	
Distillate No. 2	9.5

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
★ Residual fuel (max. 1% S)	$1.85-2.10
Gulf Coast (cargoes):	
Bunker C fuel	$2.65-3.00
New York Harbor (barges):	
Bunker C fuel	$3.10
Caribbean (cargoes):	
Bunker C	$2.55
California (rack):	
Bunker C fuel, Los Angeles	$2.85-3.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	28
200 vis. neutral (180 at 100°), 25 p.t.	26

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.67	....	....	....	....
15-15.9	2.71	....	....	....	$1.89
16-16.9	2.74	....	....	....	1.94
17-17.9	2.78	....	....	....	1.99
18-18.9	2.82	....	....	....	2.04
19-19.9	2.85	....	....	....	2.09
20-20.9	2.89	$2.75	....	$2.62	2.14
21-21.9	2.93	2.77	....	2.64	2.19
22-22.9	2.97	2.79	....	2.66	2.24
23-33.9	3.01	2.81	$3.44	2.68	2.29
24-24.9	3.05	2.83	3.46	2.70	2.34
25-25.9	3.09	2.85	3.48	2.72	2.39
26-26.9	3.13	2.87	3.50	2.74	2.44
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, part of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low Cold test Gulf Coast. ‡Sour.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, January 16, 1957.

Some crudes in North Central Texas and West Central Texas, are on the intermediate schedules.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.88
Middle District	4.70
Southwest Pennsylvania	4.41
West Virginia	4.23
Buckeye Grade	4.23
Zanesville Grade	3.27
Illinois Basin	3.15
Canada:	
Leduc-Woodbend	2.78
Redwater (Alta.)	2.67
Smiley (Sask.)	2.44
Pembina	2.65

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 36.0°-36.9°, Fao	2.00
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 39.0°-39.9°, Umm Said	2.19
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.69
Iraq, 36.0°-36.9°, Tripoli, Banias	2.69
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., clean (USMC—25%)	$2.14
★ Gulf-U.S.N.H., dirty (USMC—15%)	2.42
★ Carib.-France, dirty (USMC—50%)	3.28
★ P.G.-U.K., dirty (Scale—12.5%) (47s. 4d.)	6.63

Technical-Engineering Textbooks

FOR YOUR WORKING LIBRARY

Here is your chance to make additions to your library of popular technical texts. These books are not published by The Oil and Gas Journal, but are offered to you through the Reader Service Department. Look the list over, pick out those that you want and send your order on the blank provided.

"OIL PROPERTY VALUATION"
Paul Paine **$5.50**

Discusses oil properties and oil property interests. Covers unproved lands . . . oil and gas reserves . . . elements in valuation . . . valuation methods. Definitions and explanation make this book useful. 204 pages.

"PETROLEUM GEOLOGY"
E. N. Tiratsoo **$8.00**

A world wide survey of oil lands—with facts on their structural and stratigraphic history. Covers all important principles of modern petroleum geology. 449 pages, 122 maps and diagrams, 8 plates, 2 folders. Technology of drilling fluids described.

"ELEMENTS OF OIL RESERVOIR ENGINEERING"
S. J. Pirson **$8.50**

Develops and coordinates the principles which govern the behavior of geological petroleum reservoirs. Includes the concepts of the three fundamental equations of reservoir engineering. 441 pages.

"PETROLEUM REFINERY ENGINEERING"
W. L. Nelson **$12.00**

Gives step-by-step presentation of refining methods—practical details on plant operations. Some of subjects covered are: catalytic cracking, solvent treating, sulfur compounds, ethylene manufacture, additive materials, reboiling, etc., etc. 840 pages, 179 tables, 268 illustrations. 3rd Edition.

"HOW OIL IS FOUND"
Ver Wiebe **$8.50**

Suited to needs of oil operators, lease operators, drilling contractors, tax consultants. Includes seepages, oil rocks, structure, oil accumulation. Describes oil finding techniques fully. 247 pages, 312 illustrations.

"PRACTICAL OIL GEOLOGY"
Hager **$8.00**

New 6th edition. A clear, concise, practical book covering the fundamentals of geology—methods for searching untested areas, selection of sites, application of geology in drilling. This edition carries a section of Veatch's Rule. 589 pages, 227 illustrations, 78 tables.

"STRUCTURAL GEOLOGY OF NORTH AMERICA"
A. J. Eardley **$12.50**

Detailed description of the structural evolution of the North American continent. Double-column pages, 11¼" x 8¼", permit large drawings. Some 750 illustrations and 16 paleotectonic maps in full colors. 620 pages.

"FIELD GEOLOGY"
Frederic H. Lahee (5th edition) **$9.50**

A complete manual for petroleum and mining engineers and geologists. Presents methods and keys for recognition and interpretation of land forms and structures. Valuable new information on air photography and air photogrammetry . . . underground surveying . . . electronic location. 883 pages, 5" x 7", 630 illustrations.

"NORTH AMERICAN PETROLEUM"
Ver Wiebe **$12.00**

A history of oil finding in each of the known oil and gas pools in the U. S. and Canada. With a detailed discussion of the sequence of rocks in each area, emphasizing their thickness and nature. 495 pages—8½" x 11", with 396 maps, graphs, diagrams, etc.

"INTRODUCTION OF GEOPHYSICAL PROSPECTING"
Milton B. Dobrin **$8.00**

A practical treatment of the fundamentals, procedures, uses, and value of all the standard methods of geophysical prospecting. For each method discussed, the book covers basic physical principles, instrumentation, field techniques, reduction and interpretation of field data. 435 pages, 65 illustrations.

"FUNDAMENTALS OF RESERVOIR ENGINEERING"
John C. Calhoun, Jr. **$6.00**

A discussion of the application of engineering principles to various phases of reservoir engineering. Arranged in topical order are such subjects as Reservoir Fluids; Reservoir Rocks and Rock-Fluid Systems; Reservoir Principles—Gas Flow, Drainage and Water Influx; and Well Performance Applications. Collected from a series which appeared in The Oil and Gas Journal. 417 pages, 288 diagrams and graphs.

Title of Book	Price
.....	$ .....
.....	$ .....
.....	$ .....
.....	$ .....
Total of Order	$ .....

Payment enclosed ... Purchase order enclosed ... Mail invoice
(Make Checks payable to The Oil and Gas Journal)

Name .....
Address .....
City ..... Zone ..... State .....

Reader Service Department
THE OIL AND GAS JOURNAL
P. O. Box 1260 Tulsa 1, Okla.

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

CLASSIFIED ADVERTISING

UNDISPLAYED CLASSIFIED 26c a word one issue. 10% Discount three or more consecutive issues. $5.00 minimum charge. Blind Box in our care nine words. Payable in Advance.

DISPLAY CLASSIFIED
$18.00 a column inch one issue
10% Discount three or more consecutive issues.

Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

FOR SALE EQUIPMENT

FOR SALE: 1—6'6" ID x 70'0" tangent to tangent, 30 tray pressure vessel, shell 5/8", heads 2:1 semi-elliptical, 9/16" minimum thickness, skirt 11'0" long of 1/2" ASTM A-7 steel, 135# PSI, 450° F, Fluor Design Bubble Trays, Vessel new and unused, purchased 1953. For full details contact L. F. Mayfield, Phillips Petroleum Company, Bartlesville, Oklahoma.

PILING FOR SALE in Texas and La. 600 tons ZP-32 and ZP-27—Sheel Sheet Piling in 35 ft. and 48 ft. lengths. The Darien Corporation, 49 E. 41st St., New York 17, New York.

FOR SALE—Cardwell Spudder. In good condition, both looks and operation. Complete with all tools. Priced right. K & A Drilling Co., Phone 448R, Box 497, Ellinwood, Kansas.

UNITIZED WILSON MOGUL Rotary Drawworks; has—single drum, double pole mast, racking board, 140 Waukesha Motor, gas or gasoline, American Breakout Cathead, 4-Sheave (24") roller-bearing crownblock, Built-in Rotary table receptacle, Brewster roller bearing rotary table, All unitized on long 30' H-Beam, Moves in one load. Will sell all of above $11,500.00 with third down on approvd ecredit. Also, have WILSON MASTER single drum servicing winch, telescoping pole, V-8 motor, hydromatic drive. WILL TRADE for late model double drum winch and pay cash difference, or will sell skid-mounted $1675.00 with third down. R. F. HARE, 4000 El Campo, Ft. Worth, Texas. PE 8-5049. (Both of these units stored at WICHTEX MACHINERY yard, Wichita Falls, Texas).

FOR SALE—125 B/D Polymer Unit. California Research Corporation, stainless steel, practically new, used a few months. Skid mounted for easy removal. Believe suitable for Propylene condensation reaction. Will sell for less than one-half of new cost. Telephone: RIverside 1-4645, Dallas, Texas. Box K-267, The Oil and Gas Journal, Tulsa, Oklahoma.

TWO 6MO-970 BUDA ENGINES, complete with clutch, power takeoff and 12 volt starting system. Excellent condition. Only 1½ years old. Surplus due to electrification. The Carter Oil Company, Carmi, Illinois. Mr. M. L. Kinnan.

FOR SALE: 66' Portable Rig, Brewster Rotary Table, Capable of Drilling 3,000'. Rig ready to go. CApital 6-0034, or 501-05 Majestic Bldg., San Antonio 5, Texas.

FOR SALE
8-IN. LINE PIPE
37,000 Ft. 8⅝ in. O.D. 28.55#
Grade B Electriweld
48 Ft. DRL. all machine cleaned, straight and beveled.
EXCELLENT LIKE NEW CONDITION
Located: Frannie, Wyoming.
Priced attractively, immediate shipment.
MID-STATES PIPE AND SUPPLY CO.
TULSA, OKLAHOMA
P. O. Box 2534 Ph. CH 2-9128

FOR SALE EQUIPMENT

7000 FT. 3½ I.F. modified drill pipe; 4⅝ tool joints; elevators; rotary slips; and six (6) 5¾ drill collars. Box 297, Tyler, Texas.

USED LATE MODEL 71, 72 and 83 Speedstars, 24L Bucyrus and 1500 Failing rotary, all complete with tools. Star Drilling Supply company, Manufacturers of Rotary and Cable Tools.—Chanute, Kansas.

TANK CARS: 8—Non-insulated 10,000 gal. cap. with coils. 3—Non-insulated 8,000 gal. cap. with coils. All in very good condition. Available late July. P. O. Box A, Lyons, Illinois.

Stop Tong Breakage!
ARMITE DRILL COLLAR & TOOL JOINT COMPOUND
Armite Labs., 6609 Broad. St., Los Angeles 1, Calif.
Petro. Industries Consultants, C.A. Caracas, Venez.

FOR SALE EQUIPMENT

C-34 WALKER-NEER Spudder, with or without 5-7 tools. A-1 condition. Fully equipped. Located at Drumright, Oklahoma, Box 788 or phone 20, Drumright.

FOR SALE: One heat exchanger Griscom-Russell Model CFS-124. This equipment was purchased in 1948 but has not been used. Sealed bids will be received until 10:00 A.M., Monday, August 26, 1957. Inspection of the equipment and bid forms may be obtained by contacting Forest Products Department, Texas Forest Service, Houston Highway, Lufkin, Texas.

STEEL PIPE & TUBING
• MONEL • CARBON STEEL • STAINLESS
• CHROME MOLY • CARBON MOLY
Widest Range of Sizes & Specs in the U. S.
WRITE FOR STOCK LIST
MIDCONTINENT TUBE SERVICE, INC.
2308 Oakton St., Evanston, Ill. DA 8-4030

BRILL BUYS—THE BEST!

NEAR LONGVIEW, TEXAS

FORMER LACY REFINERY

1—Wyatt 30" x 70" Stabilizer 160# 30 tray
1—5' x 96' tower, 40 tray, 135# WP.
1—2' x 50' tower, 24 trays.
1—Ethyl lead plant.
2—Upshot heaters, 10 mil. BTU/hr.
8—Welded storage tanks, 5,000, 2,000 bbl.
8—Hi-vol pumps, 10 x 7 x 18, 10 x 6 x 12, 6 x 4 x 12, 6 x 3 x 8.

IN STOCK

VESSELS
2—12' x 45' Storage Tanks, 25#
1—14' x 21' Clay Tower, 125#
1—8' x 75' Tower, 20 Trays, 25#
1—18" x 32' Tower, 15 Trays, 160#
2—8½' x 25' Tanks, 50#
5—Packed Towers 14" x 40', 18" x 23', 160# Wyatt 1950.
1—Poly Reactor, 550#, 24" x 28'.

HOT-OIL PUMPS
3 Pacific ITB, 400 gpm.—2,000' hd. 735 gpm—3,100' hd.
5 Pacific SVTB, 612 gpm—600' hd. 324 gpm—480' hd, 308 gpm—516' hd, 193 gpm—389' hd.
1 Pacific HVTB (unused) 1270 GPM—408' Hd.
BJ hot oil pump 3 x 9, 13 st, 325 gpm, 4600' hd.

HEAT EXCHANGERS
4—Kellogg Adm. Flty. Hd. 2200, 1380 Sq. Ft., 315#
4—Kellogg Steel Flty. Hed. 800, 650, 500 Sq. Ft.
18—GR Fin Tubes, 73 Sq. Ft.
6—Brown fintube exchangers, 300# 140 Sq. Ft. 4-6 chrome
5—Steel 1,000, 900, 800, 600, 500 Sq. Ft.
6—Adm. 785, 742, 425 Sq. Ft.
30—304 SS shell & tube condensers 100-1000 Sq. Ft.

COMPRESSORS
1 Worth LTC-6 800 hp.
3 Penn Comps 100 CFM 500 lbs.
385 CFM 160 lbs.

MISCELLANEOUS
6—Bird Centrifugals 32 x 50, 24 x 38, 18 x 29.
5—Sweetland Filters No. 12, No. 10, No. 7, No. 5.
4—Rotary Vac. Filters, 10 x 12, 8 x 10, 5 x 8.
Lab Petro-Chem furnace 50,000 BTU/hr.
Tremendous selection stainless steel and steel valves 1½"-6".
Goulds 16" pump, 10,500 gpm, 135' hd.

We Own The Equipment We Advertise.

PARTIAL LIST ONLY
WIRE! PHONE! WRITE!
FOR DETAILED CIRCULAR

BRILL EQUIPMENT COMPANY

4101 San Jacinto St., Houston 4, Texas, JA 6-1351
or
2401 Third Ave., New York 51, N. Y., CYpress 2-5703

FOR SALE at Drumright and Cromwell, Oklahoma, approximately 15,000' 6" 18.97# used PE LW Beveled Line Pipe, Range One, price $1.25 per foot. Cherokee Pipe Line—Patridge—Bartlesville.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

FOR SALE: Late Model Cardwell Double Drum Spudders, Ser. #RL-666 and RL-701, complete with large inventory of tools and equipment (extra good). General Tool & Supply Co., Box 4387, Oklahoma City, Okla.

ONE PRITCHARD redwood, two cell water cooling tower, 2000 GPM designed for 115° F. initial and 100° F. final temperatures with 85° F. ambient wet bulb. Includes two 2-speed Pritchard fans with SEALDFLOW supports, Motors TEFC. Tower bolting and nailing Naval Bronze. Tower built in 1950 and used for four and one-half years. For sale in "as is" condition and to be removed from existing foundation by purchaser. May be inspected. Write, wire or phone The Pure Oil Company, P. O. Box 237, Nederland, Texas. Phone Beaumont TErminal 5-5374 or Nederland 3435.

MODEL U-15 UNIT RIG complete with L. C. Moore double jackknife derrick, 3508' new and 3200' used 4½" drill pipe, 19 drill collars. Rig and motors in A-1 condition. W. D. Kelley Drilling Co., 409 Combs-Worley Bldg., Pampa, Texas.

FOR SALE—2500 B/D refinery located in oil field and natural gasoline area. Completely overhauled in good operating condition with refinery superintendent available. Located in good gasoline market—can make 2,000,000 gallons per month of jet fuel in a very profitable operation. Equipment—2500 Barrel per day crude still; 1200 B/D Thermal Cracker; 90,000 barrels of tanks; largest tank nearly 40,000 barrels new; water well; Ethyl lead house; jet fuel loading rack; approximately 10 acres located on main Highway; property over gas. Good labor available. Priced right. Telephone: RIverside 1-4645, Dallas, Texas. Box K-268, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE EQUIPMENT

LIQUIDATION— TIDEWATER OIL COMPANY

DRUMRIGHT, OKLA., MODERN 15,000 BBL./DAY REFINERY

HOUDRIFLOW CATALYTIC CRACKING UNIT, 8000 BBL./DAY (NEW 1952)

VACUUM CRUDE DISTILLATION UNIT, 15,000 BBL./DAY (NEW 1953)

HOT OIL PUMP—PACIFIC 8 STAGE CENTRIFUGAL 55 LINED TYPE ITB 2½" 334 GPM @ 1000 PSI 750° F. 312 BHP

- CONDENSERS—HEAT EXCHANGERS
- NEW FURNACE & CONDENSER TUBES
- PRESSURE VESSELS
- PUMPS
- REBOILERS
- TANKS
- TOWERS
- CHEMICALS, PAINTS, DYES, WAREHOUSE SUPPLIES

Write For Complete Brochure

Heat & Power Co., Inc.

NEW YORK OFFICE—60 East 42 St., New York 17, N. Y.

TULSA OFFICE—310 Thompson Bldg., Tulsa 3, Okla., Diamond 3-4890

DRUMRIGHT OFFICE—P. O. Box 587, Drumright, Okla., Phone 569

FOR SALE: Gas Test Equipment. One 1951 Model Chevrolet Panel Truck complete with Onan drive compressor equipment and Ranarex specific gravity indicator. Contact The Superior Oil Company, Chickasha, Oklahoma, Yard, telephone 3303.

FLUID COUPLINGS

3—Twin Disc 27" Hud Fluid Couplings specification #91800, Drawing X-217281-A, 48" Blade Blocks for LRO Engines complete with Radiators and Spare Parts, A-1 Condition, for immediate sale.

SCHAFER DRILLING COMPANY, Phone CE 2-2531, Oklahoma City, Okla.

4 PORTABLE Automatic Electric Welding "Hard Banding" Machines. 400 Amp. welding lathe, etc., submerged arc. 4—2½ Ton Cap. Chev. Trucks, dual rear wheels, oilfield bed, roller, poles and winch. Guaranteed. Will sacrifice. P. O. Box 4444, Phone ME 7-3388, Oklahoma City 9, Oklahoma.

PRESSURE VESSELS

Two—6'0" Diameter x 93'1" long
Shell 1¼"—Heads 1½"
Code Welded—Stress Relieved
250 psi W.P.—Excellent condition
Suitable for Process or LPG Storage
Detailed Drawings Available
Priced to sell quick

Brown-Strauss Corporation

1546 Guinotte Kansas City, Mo.
HA 1-1000

TWO ROTARY RIGS FOR SALE

We are discontinuing our contracting business and have two rigs, now on contracts. One rig for 7,500 foot wells and one for 3,500 to 5,000 foot wells.

If interested in purchase, can furnish inventory and can inspect rigs while operating.

Call or Write

H & H DRILLING COMPANY

Phone MUrray 2-2032,
P. O. Box 54, Wichita 1, Kansas

Quantity Of

Type T Nagle Centrifugal Pumps

600, 700, and 800 g.p.m. 175 to 190 ft. head. Direct coupled to 60 and 75 hp. motors. Exceptionally good condition and priced to sell. Some of the finest pumps ever offered on the used market.

John I. Bloom Machinery Co.

12165 Mack, Phone LOrain 7-5920
DETROIT 15, MICHIGAN

LIQUIDATION 11,000 BBL. REFINERY

D-X SUNRAY OIL CO., ALLEN, OKLA.

We are now liquidating this modern refinery and can offer equipment at a fraction of its cost.

INCLUDED ARE: 6 Heaters with Chrome Tubes, Welded Towers from 2' to 8' with Operating Pressures up to 475 psi., Reboilers, Accumulators, Heat Exchangers, Hot Oil Pumps, Centrifugal and Steam Pumps, Boilers, Gas and Diesel Generator Sets, New Chrome Heater Tubes, Pipe, Valves, etc.

Your Inspection Is Invited. Write for Catalogue.

HEAT & POWER CO. Inc., 60 E. 42 St., New York 17, N. Y.
310 Thompson Bldg., Tulsa 3, Okla.

GAS COMPRESSORS

NEW & USED

- 375 hp Cooper-Bessemer GMX-6 new warranty.
- 800 hp Worthington in operation. Too large for present job. Owner will sacrifice.
- 100 hp Worthington "packaged unit" with 145 GKU Waukesha, skid mtd. drives & coolers, large cylinder selection. 11" stroke.
- Two ea. 7 x 3⅛ x 7 tandem CP with jacket water & gas coolers—skid mounted with engines. Approx 35 hp.
- 10 x 10 Ingersoll, skid mounted—50 hp.
- 50 hp, 6½ x 5½, 2 cyl. vert. Gardner-Denver. New. Model AAE-1003.
- New Carson "packaged units," Worthington compressor, Le Roi engine to fit your requirements.
- 120 hp packaged IR-Le Roi H-844 (new) intercooler & after cooler—new warranty.
- 160 CFM Worthington Air Compressor powered by Hercules engine.

Carson Machine & Supply Co.

ME 8-1511 OKLA. CITY
TULSA, GREAT BEND,
GARDEN CITY, KANS.

FOR SALE EQUIPMENT

FOR SALE: Owner retiring and has complete drilling rig: 1—Lee C. Moore 127' Jackknife; 1—7¼" x 18" Wilson-Snyder powered by 1 LRZ; 1—7¼" x 14" Gardner-Denver powered by 2 WAKs; U-35 Drawworks powered by 2 WAKs; and 5300' of 4½" X-Hole drill pipe. For further details call Richard B. Foretich at PLeasant 6-2554, Conroe, Texas.

HELP WANTED

PROCESS ENGINEER. Supervisory opening in operations as Unit Foreman to right man with 4 or 5 years refinery experience. Furnish record of education and experience. Box K-213, The Oil and Gas Journal, Tulsa, Oklahoma.

AGGRESSIVE INDEPENDENT oil company located in Calgary, Alberta, has opening for graduate petroleum engineer with three to eight years experience in appraisal and production engineering. Must have initiative and be responsible person. Salary range $750.00 to $900.00 a month depending on experience. Furnish details of education and experience in letter. All replies considered confidential. V. B. Harris, 3300 Republic National Bank Building, Dallas, Texas.

GAS ENGINEER

For Caracas, Venezuela

CHEMICAL ENGINEERING DEGREE.

MINIMUM 5 YEARS EXPERIENCE

including compressor plant operations, design and operating gasoline plants and gas pipeline work. Capable setting up department when required and working with government representatives.

GOOD SALARY, ALLOWANCES, OPPORTUNITY OBTAIN ADDITIONAL EXPERIENCE AND ADVANCEMENT.

Send complete details to:

C. L. LAUE

SOCONY MOBIL OIL CO., INC.

NEW YORK 4, NEW YORK

HELP WANTED

FOREIGN EMPLOYMENT. List oil companies, drilling contractors, seismograph contractors, showing where apply foreign jobs, $5.00 cash. OIML Co., Box 2603, Tulsa, Okla.

PETROLEUM ENGINEER. Intermediate size oil company operating West Coast, Mid-Continent, Gulf, and Rocky Mountains has opening for graduate engineer with minimum 3 years experience of reservoir, production, completion techniques. Location West Coast. Please furnish details of scholastic record, experience, and qualifications in resume form. Replys will be kept confidential. Box K-264, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMOGRAPH PARTY CHIEF for Rocky Mountains, must be above average in interpretation and managing field party. Good salary, expenses, auto and profit sharing. Permanent employment with an aggressive growing firm. Our employees are aware of this ad. Box K-246, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER

Immediate opening for experienced graduate engineer for employment in Louisiana Gulf Coast Area. Office and Supervisory duties on Drilling wells, Well Completions and Workovers. Send resume to:

Box K-265, The Oil and Gas Journal, Tulsa, Oklahoma.

PURCHASING AGENT—

Crude Oil and Natural Gas

Headquarters In New York City

Experience in crude oil, natural gas buying or in geological exploration. Knowledge of marketing of oil field products or in application and use of oil or gas in a refinery, natural gasoline plant, condensate plant, pipeline company, engineering office . . . valuable.

- Exceptional opportunity for advancement to management
- Attractive salary based upon work experience.

Qualified applicants may expect replies within a month. Please send resume to

Mr. E. R. Brown, Jr.
UNION CARBIDE CORPORATION
30 East 42 Street
New York 17, N. Y.

Magnolia Petroleum Company

An opening exists for an experienced equipment engineer to be assigned to our Division Petroleum Engineering Staff located in Houston, Texas. Applicant must be highly competent in the application of all phases of production equipment.

Several openings are available for experienced chemical engineers. Experience should be in general field of Chemical Engineering relating to crude oil production operations including corrosion control and water treatment.

Salary commensurate with ability and experience. Age limit 40.

Apply to:

D. V. Carter, Chief Petroleum Engineer, Petroleum Engineering Department

MAGNOLIA PETROLEUM COMPANY
P. O. Box 900, Dallas 21, Texas

GAS PLANT SUPERINTENDENT

Graduate Engineer required as Gas-Gasoline Plant Superintendent in Alberta. Previous operating experience as a prerequisite. Full employee benefits.

Apply in writing to

The British American Oil Company Limited,

Attention: A. A. WILLIAMS,

P. O. Box 130,

CALGARY, ALBERTA

HELP WANTED

CONTRACT COMPANY will pay top salary and over for qualified seismic computers, observers, and surveyors. Opportunities excellent. Give details of education, experience, and salary desired. Replies confidential. Box K-257, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE ASSISTANT

Independent engineering contractor specializing in natural gas-gasoline process design and construction has immediate opening for chemical or petroleum engineer. Applicants must be experienced in process and mechanical design with general knowledge of construction. Position as executive assistant will require moderate travel as principal activities will be customer contact work and coordination of engineering-procurement-construction of projects in process. Salary commensurate with ability and experience. Liberal bonus. Age limit, 38. Location, Tulsa. All information will be considered confidential. Reply

Box K-263, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEERS
GEOPHYSICISTS
(South America)

Immediate openings with major oil company for graduate engineers with experience in drilling, production, reservoir and equipment; also geophysicists experienced in interpretation and supervision. Working knowledge of Spanish desirable but not essential.

Liberal Employe Benefit Plans. Salary commensurate with experience.

Forward personal data and college transcript to: Box K-249, The Oil and Gas Journal, Tulsa, Oklahoma.

. . . ELECTRICAL . . .

ENGINEERS

Subsidiary operating in Venezuela has career openings for 2 graduate electrical engineers with experience in design, construction & maintenance of power generating & distribution systems.

QUALIFICATIONS:—
B.S.E.E.—Minimum 3 years
Diversified experience
Salary Commensurate with Experience

. . . GULF OIL . . .

Corporation

P. O. Box #35
Bowling Green Station
New York 4, New York

HELP WANTED

REFINERY ENGINEER for independent company located in Kansas. Project estimating, design and drafting experience. Give detailed resume of education, experience and salary expected. Box K-226, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES REPRESENTATIVE for oilfield supply firm to call on district offices. Must have oilfield supply and tubular products experience. Probably presently employed. Western Kansas area. Salary open. Write P. O. Box 2205, Tulsa, Okla.

WANTED, PETROLEUM ENGINEER: Expanding independent oil company has opening for petroleum engineer with two to four years experience. Write Drilling and Production Department, P. O. Box 749, Denver, Colorado.

FIELD SALESMAN for oilfield supply store. Must have general oilfield supply and tubular products experience. The man we want is probably presently employed. Oklahoma or Kansas area. Salary open. Write Box 2205, Tulsa, Oklahoma.

GEOLOGIST WANTED by established independent producing company. Must have two or more years of experience in Oklahoma subsurface work. Position affords permanent employment in Tulsa, Oklahoma. Applications will be confidential. Box K-273, The Oil and Gas Journal, Tulsa, Oklahoma.

SOUTH AMERICA

- Career employment with Major American Oil Companies • Salaries Open • Cost of Living Allowance • Monthly Bonus.

NO U. S. INCOME TAX
OUR FEE AND TRANSPORTATION PAID

Maximum Age to 40

- ENGINEERS, ALL TYPES—Degree required. Exp. or inexperienced.
- GEOLOGIST, Deg.—Age to 32. Single
- GEOPHYSICIST, Deg., 3 yrs. experience, age to 45.
- TOOLPUSHERS, 3 to 5 yrs. experience
- MECHANIC GAS, 5 yrs. experience.
- MECHANIC DIESEL, 4 yrs. experience
- FOREMAN CONNECTION, 3 yrs. experience.
- FOREMAN PRODUCTION, 5 yrs. experience.
- MUD TECHNICIAN, 1 yr. experience. Age to 32.
- STENOGRAPHER, Male, 1 yr. exp. Age to 32. Must be single.

All information confidential.
Send complete resume to:
OVERSEAS EMPLOYMENT SECTION

CHAS. J. LOVELESS PERSONNEL SERVICE
616 S. Main • Tulsa, Okla. • GI 7-3193

SITUATIONS WANTED

GEOLOGIST: nine years Texas and Mid-Continent. Major, independent as District and Chief Geologist, and consulting experience. Can handle exploration, development, evaluation, completion. Masters degree. Desires responsible position with independent company. Box K-237, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY SUPERINTENDENT desires connection with refining or petrochemical company. Twenty years experience with proven administrative ability in all phases modern refinery operations. Excellent references. Box K-256, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST: Age 30, veteran, B.S. degree in geology. Five years experience in Rocky Mountain area and Canada. Some Gulf Coast experience. Desires position with small company or independent. Box K-222, The Oil and Gas Journal, Tulsa, Oklahoma.

CONSULTING GEOLOGIST: Albuquerque, New Mexico. B. S. Degree, 6 years' experience all phases of exploration, development, land, drilling deals in West Texas, New Mexico, Four Corners Area, Julesburg Basin, and Wyoming. Desires retainer-interest position with active operator. Good references. Jack Q. Frizzell, 7114 Central, S. E., Albuquerque, New Mexico.

SITUATIONS WANTED

PETROLEUM ENGINEER: Age 34, single, B.S. General Engineering and Chemical Engineering; 2½ years domestic and 6½ years varied experience drilling and completion with major in South America. Desire domestic or foreign employment. Box K-258, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING SUPERINTENDENT. Age 34. Graduate Engineer. Married 10 years experience in Drilling and Production work wants job with drilling contractor or small production company. Box K-250, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST - SUPERVISORY: Seventeen years combined experience; 12 years East Texas, Arkansas, Louisiana, Mississippi, and Southeastern United States. Extensive background in exploration, development, and evaluation at management level. Widely known, good standing and reputation, excellent references. Wish to relocate. Available immediately. Will consider Canadian or domestic employment. Box K-252, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: Eleven years experience as Chief Geologist, and Manager of Exploration for Independent and Major, in United States, Latin America. Qualified to manage all phases, Petroleum Exploration, Development, Evaluation. Desires responsible position in the United States or Foreign Country. Box K-272, The Oil and Gas Journal, Tulsa, Oklahoma.

PROJECT ENGINEER, mature, successful record in project management, petroleum refining, petrochemicals, from contract stage to erection. Supervised layouts, equipment design, specifications, job schedules, progress reports, coordination procedures, customer relations. European and South American experience, languages, contacts. Interested in project supervision or sales representation abroad. Box K-274, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINER-SUPERINTENDENT or administrative assistant to executive. Experienced modern process operations, economics, costs, planning. Good administrator. Degree. Box K-269, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGICAL ENGINFER: Age 32. Presently DIRECTOR OF EXPLORATION for leading Independent. Can capably manage an Exploration and Developmental Program. Desire a salary-interest arrangement for family security. Box K-271, The Oil and Gas Journal, Tulsa, Oklahoma.

MANUFACTURER'S REPRESENTATIVE—Sales Engineer over 15 years top sales record and managerial experience with excellent New York City contacts, Industrials, Engineers and Contractors, wants represent equipment manufacturer. Box K-270, The Oil and Gas Journal, Tulsa, Oklahoma.

PUBLIC RELATIONS-COORDINATION: Twenty years experience in Management and Executive capacities. Eight in Rocky Mountains. Governmental relations highlighted. Responsible family man. Desire Rocky Mountain location—preferably Casper. Proven record of accomplishment. Furnish abundance of references. Ready immediately. Box K-266, The Oil and Gas Journal, Tulsa, Oklahoma.

FARMS AND RANCHES

8500 ACRES South Dakota ranch. 7200 acres minerals leased to Major Oil Co. $30. acre. Wells Land Co., Nowata, Okla.

BUSINESS SERVICE

NUCLEAR INSTRUMENTATION and consultation for oil producing operations. Nucor Research, Inc., 2421 Wolcott, Ferndale, Michigan.

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware

SERVICES

MONITA EXPLORATION INC.
3210 N. Big Spring Midland, Texas

Experienced & Qualified Personnel in Geologic Surface Mapping with Paleoidentification; Well supervision; Subsurface Correlation; and Research Ionization Surveys.

FOREIGN DOMESTIC

ROYALTIES

HIGHEST PRICE PAID for oil and gas income royalties, overrides, oil properties. A. S. Berry, 520 Wright Bldg., Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

15,000 ACRES under lease for oil and gas in Forest City Basin, S.W. Iowa. Good Geology. Warrants drilling expenditure. Contact R. A. Trygg, Ogden, Iowa.

OIL AND GAS MINERAL LEASES available in Dell City area of Hudspeth County, Texas. U. S. Geological Survey Map shows anticlinal axis nearby favorable for oil-gas structure. Am fee landowner of over 2000 acres. Write quickly to: Jefferson G. Smith, 215 Littlefield Building, Austin 15, Texas.

UTAH OIL LEASES

on lands owned by U. S. gov't. 640 acre 5 year leases; renewable 5 more. Very small rent. You do no drilling; pay no taxes; may assign lease to oil companies. Read customers' letters who did, for good cash profits and retained royalty in lease. We have land selected and file your lease application in gov't. office. Great lease boom in Utah. Fine speculation. Information free. John L. Donahue, Empire Build., Denver 2, Colo.

OIL LEASES IN BOOMING

4-Corners Area. November Indian Lease sale brought 30 Million Dollars. Some leases sold for $3,200 per acre. Wells estimated up to 1500 barrels of oil per day. Oil Leases from $2.25 an acre. Fortunes being made. Write for free information now. **ATLAS OIL SURVEY, Dept. OJ-7, Colorado Bldg., Denver 2, Colo.**

BUSINESS OPPORTUNITIES

FUNDS AVAILABLE to drill 100 wells on proven acreage only. Detailed offers invited. Box 613, Fort Worth, Texas.

DRILLING CONTRACTORS able to make drilling contract in France wanted. Write to S.I.R.E.P. 19, Cours Pierre Puget, Marseille, France for information.

HEALTH FORCES sacrifice sale of this exceptional 11 year old $100,000 volume business! The company's permit allows owner to haul any material or equipment pertaining to oil or gas business. Centrally located in heart of gas and oil field area and fine farming, it is near state university and industries and oil refineries. Unlimited potential for go-getter. Dimit Trucking Co., Mount Pleasant, Mich.

WANT BROKER to set up company to fully develop 10 producing leases, thirty wells now on properties. H. A. Miller, Glasgow, Ky.

FINANCIAL CONTACTS. Underwriters, Brokers, Private Finders of Capital reached. No shopping. Confidential. FREE ENTERPRISE ASSOCIATES, 817 51st St., Brooklyn, N. Y.

ATTENTION:

Engineers,
Parts Manufacturers,
Business Men and
Company Heads!

Successful Western Canadian Manufacturer . . . with proven engineering ability . . . and rapidly expanding facilities . . . will manufacture small parts on royalty or contract basis. Willing to purchase additional machinery if required. Manufacturer has sound grasp of Canadian markets and needs.

Contact:

Alberta Engineering Ltd.

Box 789, Wetaskiwin, Alberta, Canada.

ELECTRIC LOG CABINETS

FOR ECONOMICAL FILING of full-size electric logs, most geologists prefer Kraftbilt E-24 4-drawer cabinet. Two compartments to each drawer with separate follow blocks make this cabinet handy, economical. For filing reduced electric logs, geologists use Kraftbilt E-28 8-drawer cabinet. Send for catalog 57-B. Ross-Martin Co., P. O. Box 900-A, Tulsa, Okla.

WANTED

WANTED—Oilfield sales and service organization to act as manufacturers representative for production equipment. Distributorships now available for California and Oklahoma. Box K-243, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—Pipeline Flying. Commercial Pilot. Kansas, Oklahoma, or Texas. Chas. McAfee. Wellington, Kansas.

BEAT-UP TITLE MAN, haywire mechanic wants grup-stake. Box K-260, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION FOR SALE

CAN DELIVER 1,000 to 5,000 bbls. crude oil daily, low grade or regular in tank cars or in pipe line at Wyoming points. Producer, P. O. Box 2362, Denver, Colorado.

PRODUCTION WANTED

WANT TO BUY—Oil Properties, settled or semi-settled production. 100 to 5,000 barrels daily in Oklahoma and Kansas. Contact Morris Sitrin, 1215 First National Building Tulsa, Oklahoma.

PRODUCING oil, gas properties, also royalties wanted. Any size, any amount. Complete details in first letter. Box 231, Scarsdale, N. Y.

EQUIPMENT MEN...

Geophysical Service Moves Into New Dallas Building

Geophysical Service, Inc., has moved into offices in Dallas' new Exchange Bank Building. GSI President F. J. Agnich said GSI's administrative, marketing, personnel, geophysical engineering and research groups are headquartered in the new building. GSI's warehouse, field service department and automotive shops have recently moved into new quarters in the Trinity industrial district. GSI's seismic data processing office also will be located in the bank building.

Expanded manufacturing operations of the semiconductor-components and apparatus division of Texas Instruments, Inc., GSI's parent company, will occupy space vacated by GSI on Lemmon Avenue.

Byron Jackson Tools Offers New Slide Films

V. C. Horner, vice president in charge of sales for Byron Jackson Tools, Inc., has announced the availability of three new BJ product films.

These full-color sound-and-slide films are offered for showing to oil-company, supply-store and other interested groups. They illustrate three separate lines of BJ oil tools and application of various models and products within each line. The first film features BJ elevators for casing, drill pipe, tubing and sucker rods in sizes including the new 500-ton elevator-spider. A second film covers BJ manual tongs including casing, drill pipe and tubing types. A third film features the BJ-PB line of oil-field rubber products, including stretch-on and Safe-Lok protectors, pipe wipers, wire-line guides, mud guns and other products.

ADVERTISERS IN THIS ISSUE

Aero Design and Engineering Company 11
Ajax Iron Works 18
Allis-Chalmers Mfg. Co. 35
American Chain & Cable—
Helicoid Gage Division 162
R-P & C Valve Division 41
American Petroleum Institute 143
Armstrong Machine Works 135
Associated Brine Industries 45
Atlas Powder Company, Aquaness Department 31
B and W Inc. 139
Babcock & Wilcox Company—
Boiler Division 151
Baker Oil Tools, Inc. 75
Baker-Raulang Company, A Subsidiary of Otis Elevator Company 8
Baroid Division, National Lead Co. 24
Bethlehem Steel Co. 101
Bower Roller Bearing Company 36
Brown & Root, Inc. 79
Bucyrus-Erie 138
Cabot Shops, Inc. 13
Cameron Iron Works, Inc. Inside Front Cover
Caterpillar Tractor Co. 123
Central Scientific Company 34
Century Electric Company 19
Chain Belt Co. 26
Chicago Bridge & Iron Company 73
Classified Advertising 190, 191, 192, 193, 194
Coating Laboratories, Inc. 178
Coffing Hoist Division, Duff-Norton Company 159
Crose Manufacturing Co., Inc., M. J. 133
Cutler-Hammer, Inc. 117
Darling Valve and Mfg. Co. 153
Diamond Chain Company, Inc. 164
Dow Chemical Company, The 10
Dowell Incorporated 58
Drilling & Service, Inc. 179
du Pont 5
Eastman Chemical Products, Inc. 119
Edward Valves, Inc. 158
ElectroData Division of Burroughs Corporation 47
Esso Research and Engineering Company 27
Ethyl Corporation 98, 99
Fairbanks, Morse & Co. 4
Fielden Instrument Division Robertshaw-Fulton Controls Company 152
First National Bank of Shreveport, The 173
First National Bank & Trust Co. of Tulsa, The 176
Fleet-Line Co. 134
Foxboro Company, The 113
Fulton & Company, R. H. 130
General American Transportation Corporation 76
General Electric Company 109
General Paint Corp. 134
Goodyear Tire & Rubber Company, The 9
Grancell, I. H. 137
Guiberson Corporation 180
Halliburton Oil Well Cementing Co. 16, 17, 169
Helicoid Gage Division, American Chain & Cable Co. 162
Higgins, Inc. 128
Hughes Tool Co. Back Cover
Inferno Co., The 137
Infilco Incorporated 121
International Harvester Co. 42, 43, 106
Iverson Supply Company 50
Jones & Laughlin Steel Corporation 28
Jones & Laughlin Supply Division 37, 38, 39, 40
Larkin Packer Company, Inc. 177
Levingston Shipbuilding Co. 173
Lone Star Steel Company 82
Lufkin Foundry & Machine Co. 22
Macco Oil Tool Co. 150
Maloney Company, F. H. 124
Mannesmann Tube Company, Ltd. 136
Manzel Division of Houdaille Industries, Inc. 48
Marley Company, Inc., The 23
Martin, Manufacturer, John N. 53
Mayo Hotel, The 150
McEvoy Company 183
Mercantile National Bank 133
Mercoid Corp., The 134
Mid-Continent Supply Company 30
Miller Sand Pump Co. 139
Mission Mfg. Company 105
Monsanto Chemical Company 51
Moore Corporation, Lee C. 111
Oil and Gas Journal, The 178
Oil Center Tool Co. 14
Oil States Rubber Co. 162
Orbit Valve Company 114
Pacific Lumber Company, The 133
Parkersburg Building Division, The Parkersburg Rig & Reel Company 15
Peerless Supply Co., Inc. 134
Penberthy Manufacturing Company, Division of Buffalo-Eclipse Corporation 140
Petroleum Distributing Co. 150
Phoenix Manufacturing Company 196
Plastic Applicators, Inc. 160
Price Company, H. C. 54
Proto Tools 46
Republic National Bank of Dallas 135
Robbins & Myers, Inc. 146
Rockwell Manufacturing Company 147, 148
Rockwood Sprinkler Company 129
Ross-Martin Co. 139
R-P&C Valve Division American Chain & Cable 41
SKF Industries, Inc. 25
Solar Aircraft Company 7
Spang & Co. 149
Square D Company 20, 21
Thomas Flexible Coupling Co. 175
Thornhill-Craver Co. Inside Back Cover
Timken Roller Bearing Company 32, 33
Trane Company, The 144, 145
Tretolite Company, A Division of Petrolite Corporation 49
Tulsa Winch Division of Vickers, Inc. 142
United States Treasury Dept. 155
United Steel Companies, Limited, The 29
Universal Oil Products Co. 12
Valdura Paint Division, American-Marietta Co. 45
Vogt Machine Co., Henry 44
Wallace & Tiernan, Incorporated 154
Walworth Co. 1
Warren Petroleum Corporation 56
Well Equipment Mfg. Corp. 157
Williams Brothers 52
Witte Engine Works Oil Well Supply Division, United States Steel Coporation 6

LEGAL

U. S. instrust for Chitimacha Indians, offers oil and gas lease on 262.23 acres more or less, of tribal land in St. Mary Parish, State of Louisiana, known as Chitimacha Indian Reservation. Sealed bids to be opened at the Choctaw Indian Agency, Philadelphia, Mississippi at 10:00 A.M. Central Standard Time, Thursday, July 25, 1957. Invitations to bid and additional information concerning sale may be obtained from Choctaw Indian Agency, Philadelphia, Mississippi.

LEGAL

Sealed bids will be received until July 31, 1957, 2:00 P.M., Mountain Standard Time, and opened at that time in the Office of the Superintendent, Crow Indian Agency, Crow Agency, Montana, for the leasing of 2,267.20 acres of Tribal land located in Township 1 N., R. 36 E.; T. 3 N., R. 34 E; and T. 3 N., R. 35 E., Big Horn and Treasure Counties, Montana, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of Crow Indian Agency, at Crow Agency, Montana.

Forged Steel. Shot Blasted. All Phoenix flanges meet full A.S.A. specifications — carbon steel and alloy.

Spot faced bolting surfaces, extra fine facings, accurate threading and a protective coating are typical of Phoenix quality.

Precisely machined welding bevel.

Special facings, bores, drilling, threading and special machining available.

The long life and precision workmanship you have a right to expect in the flanges you buy are assured when you order Phoenix forged steel flanges. You simply can't buy a better flange! It costs no more for Phoenix quality and *service*. That's why it's always worthwhile discussing your pipe flange requirements with the Phoenix representative.

A serrated gasket surface finish is standard on all Phoenix flanges with raised facings.

Write for handy 36 page pocket-size reference booklet containing useful data on flanges. It's FREE!

Leading Manufacturers of Pipe and Tank Flanges and Commercial Forgings

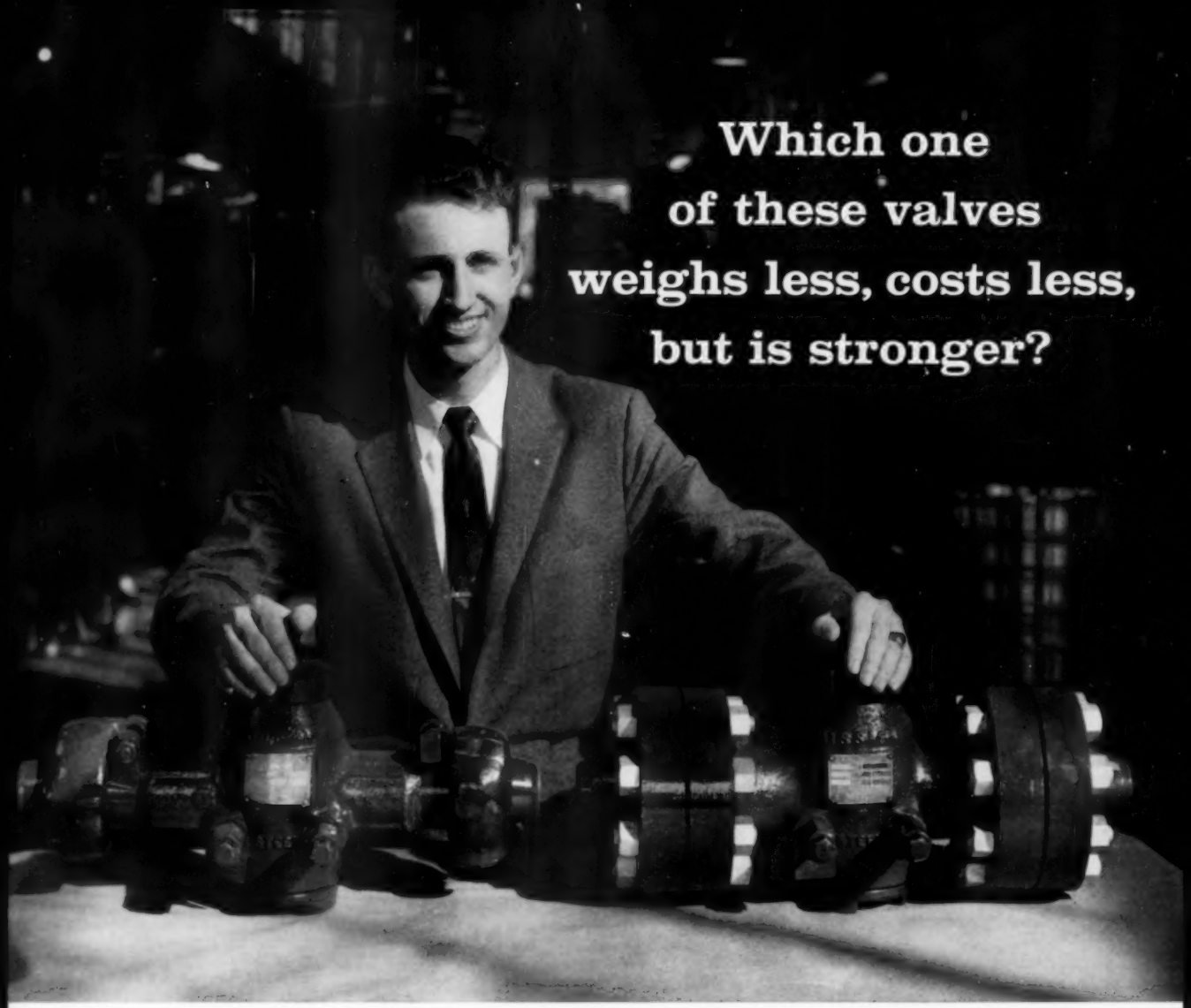
PHOENIX

FLANGE AND FORGING DIVISION

PHOENIX MANUFACTURING COMPANY

CATASAUQUA, PA. • JOLIET, ILL. • FOUNDED 1852

Integrated Manufacturing Facilities: FLANGE AND FORGING DIVISION, STEEL MILL DIVISION, HORSESHOE PRODUCTS DIVISION, RUBBER PRODUCTS DIVISION, OIL AND GREASE SEAL DIVISION



Which one of these valves weighs less, costs less, but is stronger?

Both of these valves are of the same make, model, size, and pressure rating. One is equipped with 2″, 6000 lbs. test, Unibolt Couplings, the other with 2″, Series 900 flanges. The Unibolt-equipped valve weighs 102 lbs. less, costs about 10% less, and is approximately 28% stronger!

And the advantages don't stop there. Because it weighs less, the Unibolt-equipped valve costs less to ship and is easier to handle, easier to install. (Two bolts and nuts, compared to 16 bolts and 32 nuts.)

Unibolt Couplings are easy to attach to any valve. Either hub of the Coupling may be butt-welded, socket-welded or screwed to the valve body.

Even if steel were plentiful, Unibolt-equipped valves—as opposed to flanged valves—would be your best buy.

THORNHILL CRAVER CO.

P. O. Box 1184, Houston, Texas

ask your supplier to furnish unibolt-equipped valves

why offshore operators prefer "FLASH-WELD"

With operating costs in the Gulf running as high as $400 per hour, downtime to change tool joints is prohibitive.

That's why a vast majority of the offshore operators are running drilling strings unitized with hardfaced "Flash-Weld" joints. Never has preference for a product been so clearly demonstrated.

Safety, dependability and *economy* — the three reasons that have made "Flash-Weld" the outstanding choice offshore — are the same reasons operators, generally, have long preferred this superior tool joint-to-pipe connection.

Pioneered and developed by HUGHES, "Flash-Weld" tool joints have been used in unitizing more than 36,000,000 feet of drill pipe.

FLASH-WELD
A DEVELOPMENT
OF
HUGHES
TOOL COMPANY
HOUSTON, TEXAS

Developers of "Flash-Weld", "Seal-Grip" and Counterbore Weld Tool Joints